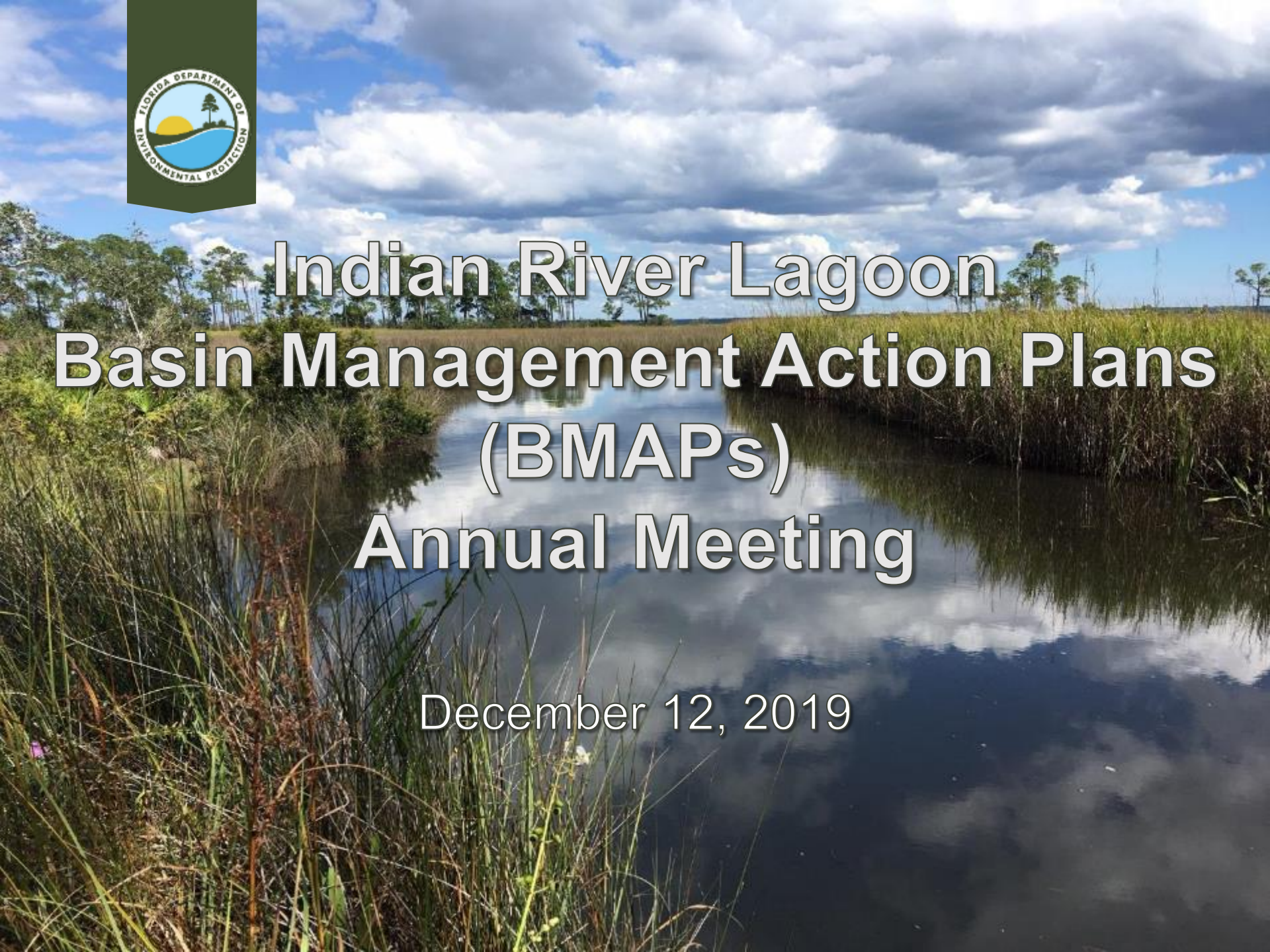


Indian River Lagoon Basin Management Action Plans (BMAPs) Annual Meeting

December 12, 2019

Agenda

- Shoreline Restoration
- Muck Removal Guidance Update
- Saint Johns River Water Management District (SJRWMD) Water Quality Update
- Overview of the Indian River Lagoon (IRL) BMAPs
- Update of BMAPs
- Allocation Approach
- Statewide Annual Report
- Next Steps

Indian River Lagoon Basin Management Action Plan (BMAP) Public Meeting

Protocol for Shoreline Stabilization TMDL Credit Overview

Patrick Air Force Base, Florida

December 12, 2019

Laurel Webb, PE
MSE Group, LLC
706.482.8196
lwebb@msegroup.com

Ecological | Environmental | Engineering

Protocol Development

- 45th Space Wing (45SW) developed protocol to capture credit from multiple shoreline stabilization projects
- Multiple meetings held with the USACE, 45SW, and FDEP about protocol development
- Adapted from protocols followed by stakeholders in Chesapeake Bay TMDL
- FDEP approved protocol on 25 September 2019

Protocol Overview

1. Prevented Sediment
    - A mass reduction credit for prevented sediment.
    - Based on historical shoreline erosion rates and sediment sampling.
2. Denitrification
    - Credit for marsh denitrification based on the denitrifying capabilities of marsh soils.
    - Based on wetland plantings and marsh soil sampling.
3. Marsh Redfield Ratio
    - Credit for the vegetative uptake of nutrients for vegetative growth in marshes.
    - Based on wetland plantings and plant tissue sampling.

Protocol Implementation

- Quarterly Sampling beginning February 2020
- Approximately 3,000 linear feet of shoreline at Patrick Air Force Base
- Results to be included with Statewide Annual Report in 2021

Questions & Comments

Crediting Muck Removal

Mary Paulic

Mary.Paulic@floridadep.gov

Why Be Concerned About Muck?

- Muck contains nutrients that flux into water column
  - Increases turbidity
- Negative impact on seagrasses
  - Loss of habitat due to poor substrate
  - Nutrients aid growth of phytoplankton, drift macroalgae, and epiphytes
    - Attenuates light reaching seagrass, constraining growth and propagation
- The first Indian River Lagoon (IRL) muck credit guidance produced in 2012; this is the replacement guidance, *which is specific to the IRL*

What is Muck?

- Sediment that is dark grey to black in color, > 75% water by weight, and ≥ 10% organic matter (dry weight basis) (Trefry and Trocine 2011)
  - Loss on Ignition (LOI) at 550°Celsius (C)
- Generally derived from terrestrial sources

General Considerations

Constraints for Earning Credits

- Removal of muck to natural substrate to the maximum areal extent possible
  - Natural substrate as sand, sand-shell, or muddy sand

- Crediting of muck removal best applied to Lagoon proper or downstream portions of tributaries connected to Lagoon
  - Upstream limit. Salinity of $\geq$ 1 parts per thousand (ppt) to delineate potential credited area

Source Control

For Reducing Muck Accumulation

- Awarding of credit for muck removal dependent on having a plan for erosion control such as:
  - Erosion and sediment control ordinance
  - Landscaping ordinance
  - Street sweeping
  - Maintenance of vegetative cover
  - Outreach program

Crediting

Nutrient Flux Rates

- IRL specific flux rate
  - Natural substrate ammonia average 2,100 kilograms per square kilometer per year (kg/km^2/yr)
  - Natural substrate phosphorus average 200 kg/km^2/yr
- Relationship between benthic flux and % organic matter as LOI

% LOI @ 550°C	Muck Ammonia Flux (kg/km^2/yr)	Muck Phosphorus Flux (kg/km^2/yr)
10.0 – 10.9	8,000	400
11.0 – 11.9	9,000	500
12.0 – 12.9	10,000	700
13.0 – 13.9	11,000	800
14.0 – 14.9	13,000	1,000
15.0 – 15.9	15,000	1,200
16.0 – 16.9	17,000	1,500
17.0 – 17.9	20,000	1,800
18.0 – 18.9	25,000	2,300
19.0 – 19.9	31,000	3,000
≥20	41,000	3,900

Crediting

Steps for Calculating Credits

- Need % LOI, area to be dredged, depth of muck
  - Appendix A outlines grab sediment sampling for muck presence, depth, color, odor, % LOI, and how many samples to collect for size of dredge area

- Net flux rate = muck deposit flux rate - natural substrate flux rate
  - Net flux = net reduction in the mass of total nitrogen (TN) or total phosphorus (TP)
  - Maximum flux rate allowed at ≥20 % LOI
- BMAP credit = net flux rate x total area dredged

Crediting

Awarding Credits and Reporting

- Final BMAP credit awarded with post-dredge assessment
  - Post-project muck thickness and nutrient flux rate
  - 180 days from project completion to report
  - Credit awarded for 10 years
  - Check of muck depth required at 5-year mark
- Additional 10 years of credit (maximum of 20 years)
  - Effective source controls are in place or in progress (plan), and
  - Median muck thickness ≤30 centimeters (cm)
  - Otherwise, the actual flux rates are measured and the result could be reduction or cessation of credits

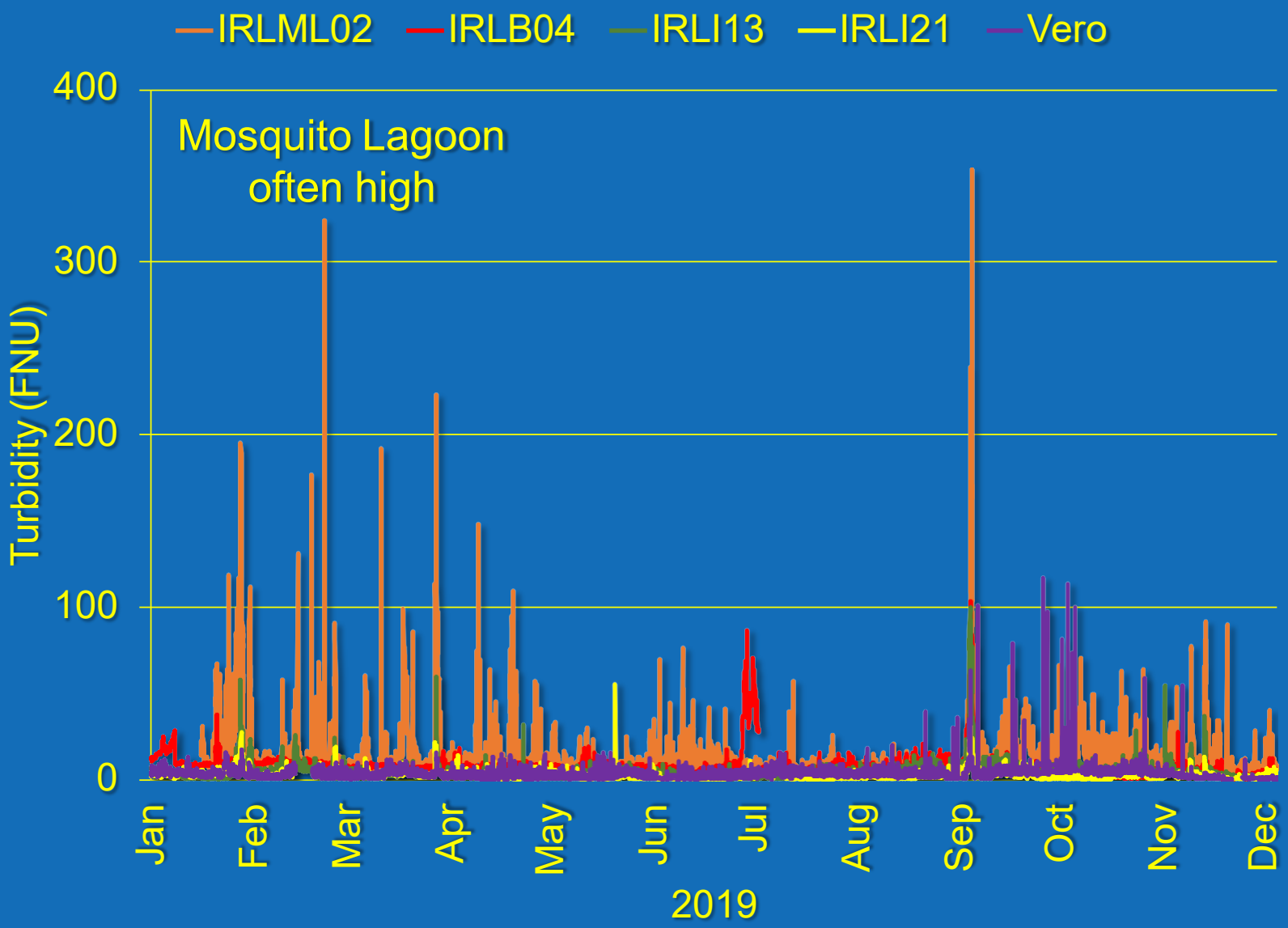
Crediting

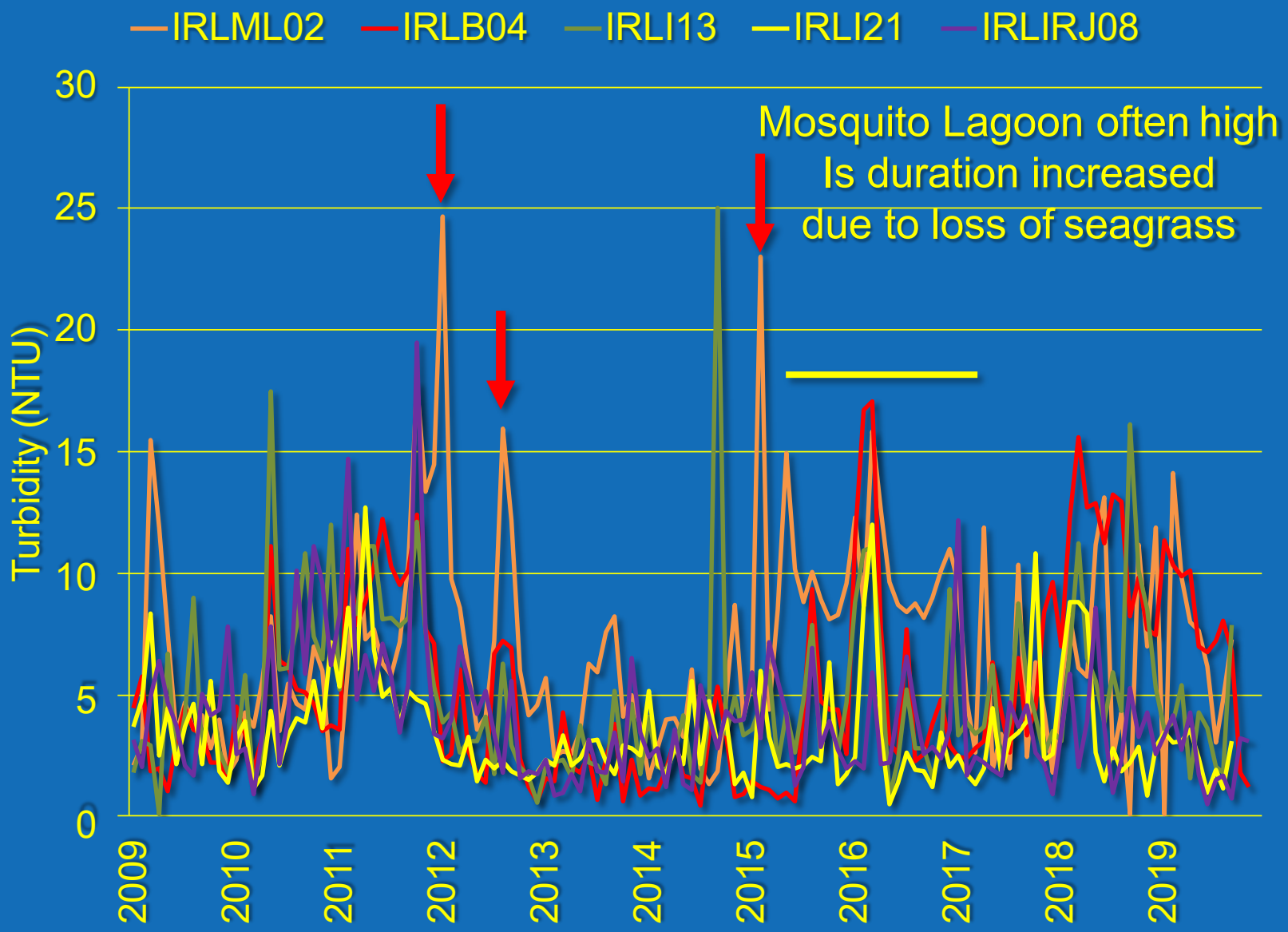
Reduction in Credits

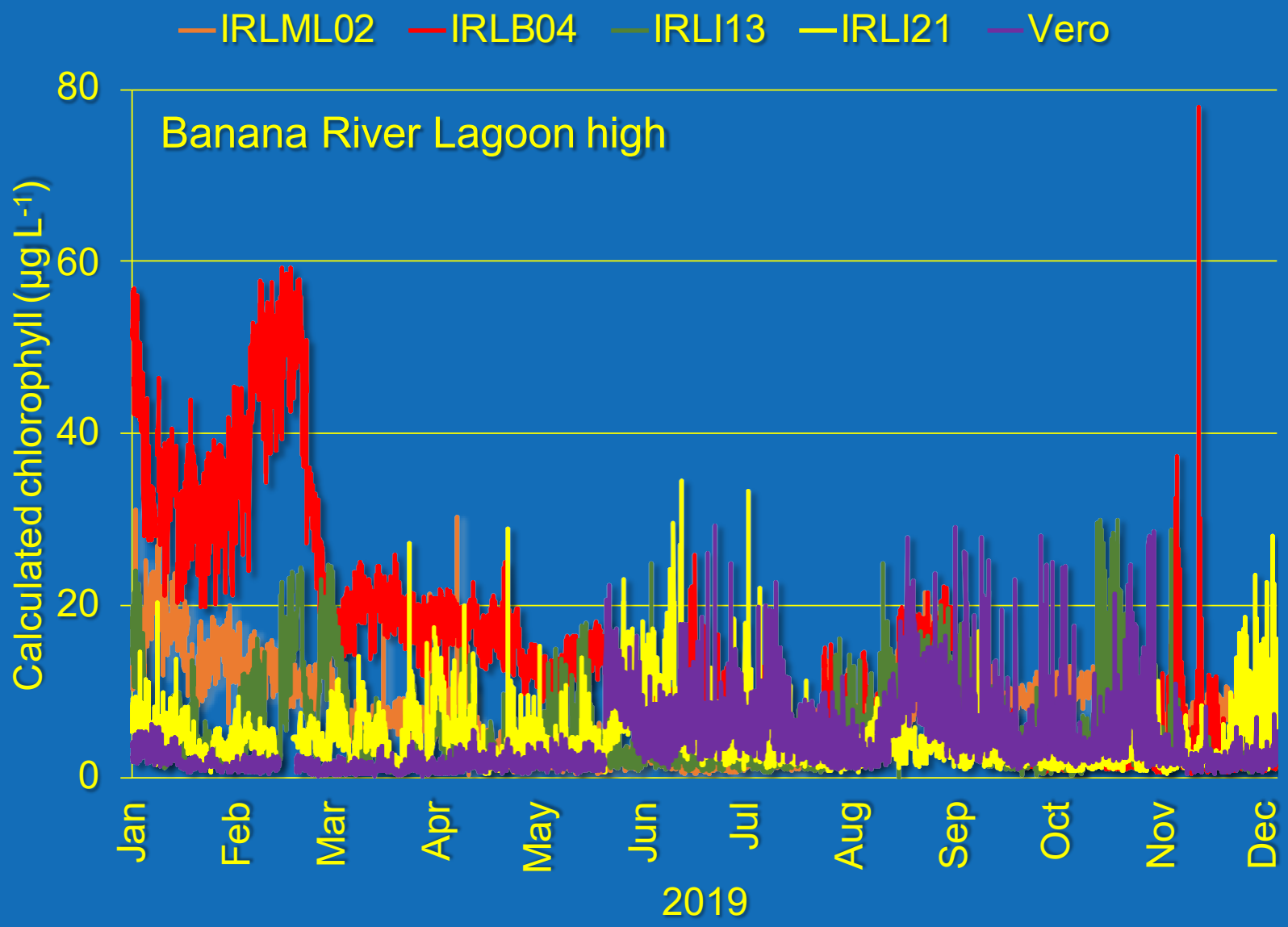
- Reduction in final credit
  - Post project median depth > 30 cm and post-project net flux exceeds initial net flux
  - Reduce credit by difference in initial and post net flux
- Note that this approach and the flux rates are specific to the IRL. Muck removal credit in other basins will require flux data specific to that location.

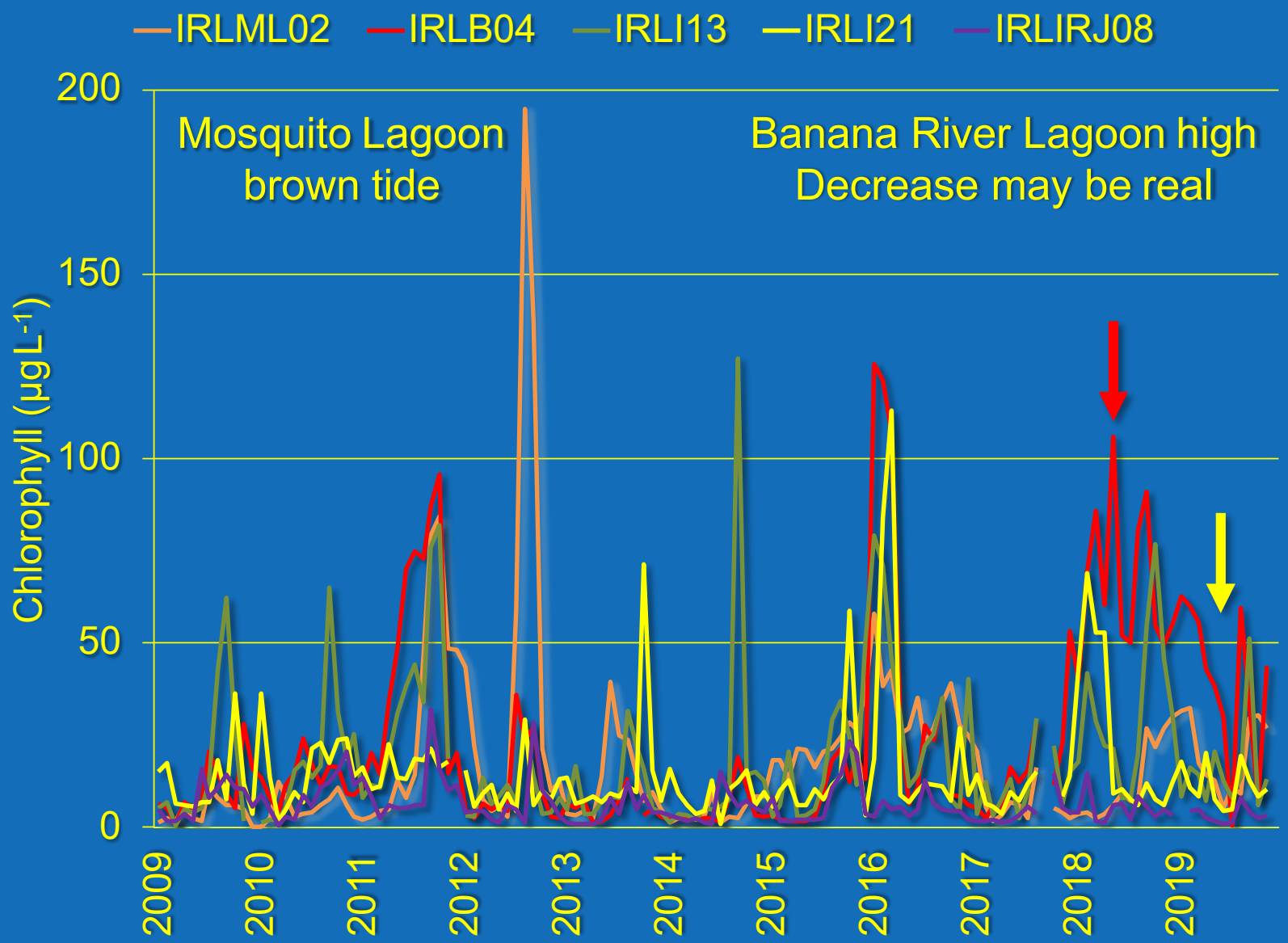
Indian River Lagoon

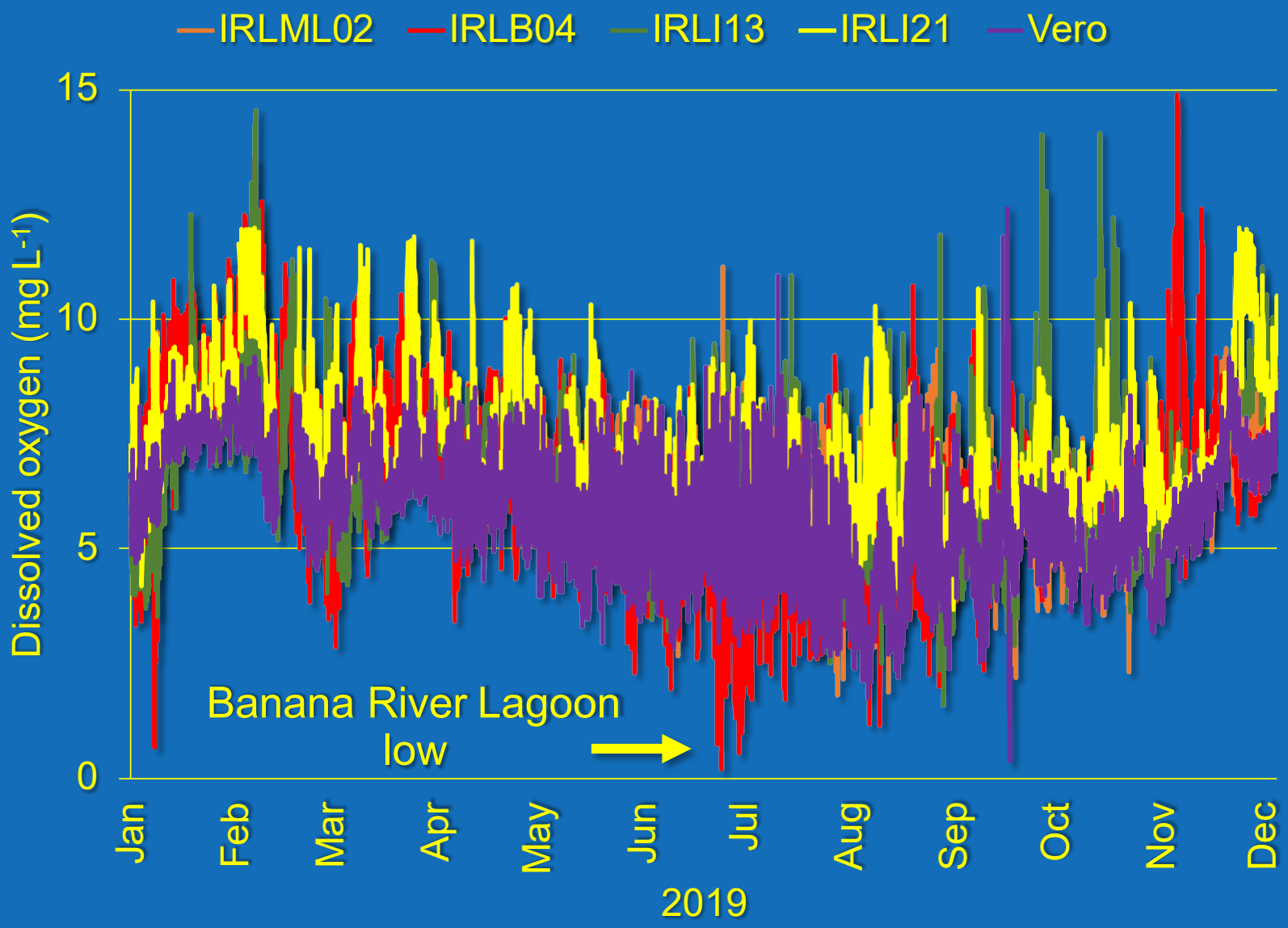
Chuck Jacoby
Supervising Environmental Scientist
Estuaries Section
Division of Water and Land Resources
cjacoby@sjrwmd.com
386-329-4243

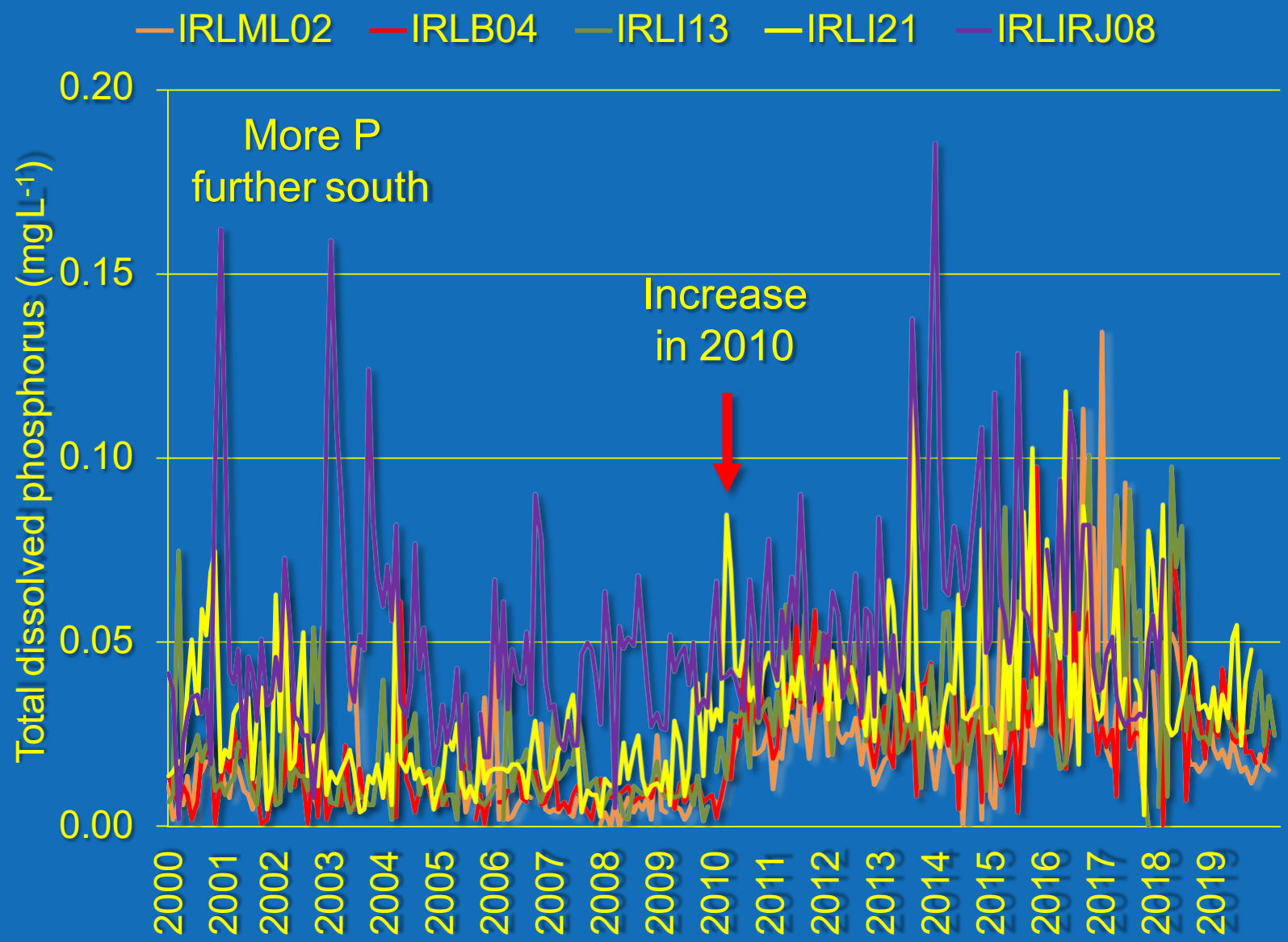

IRLML02
IRLB04
IRLI13
IRLI21
Vero
Mosquito Lagoon often high
Turbidity (FNU)
400
300
200
100
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2019

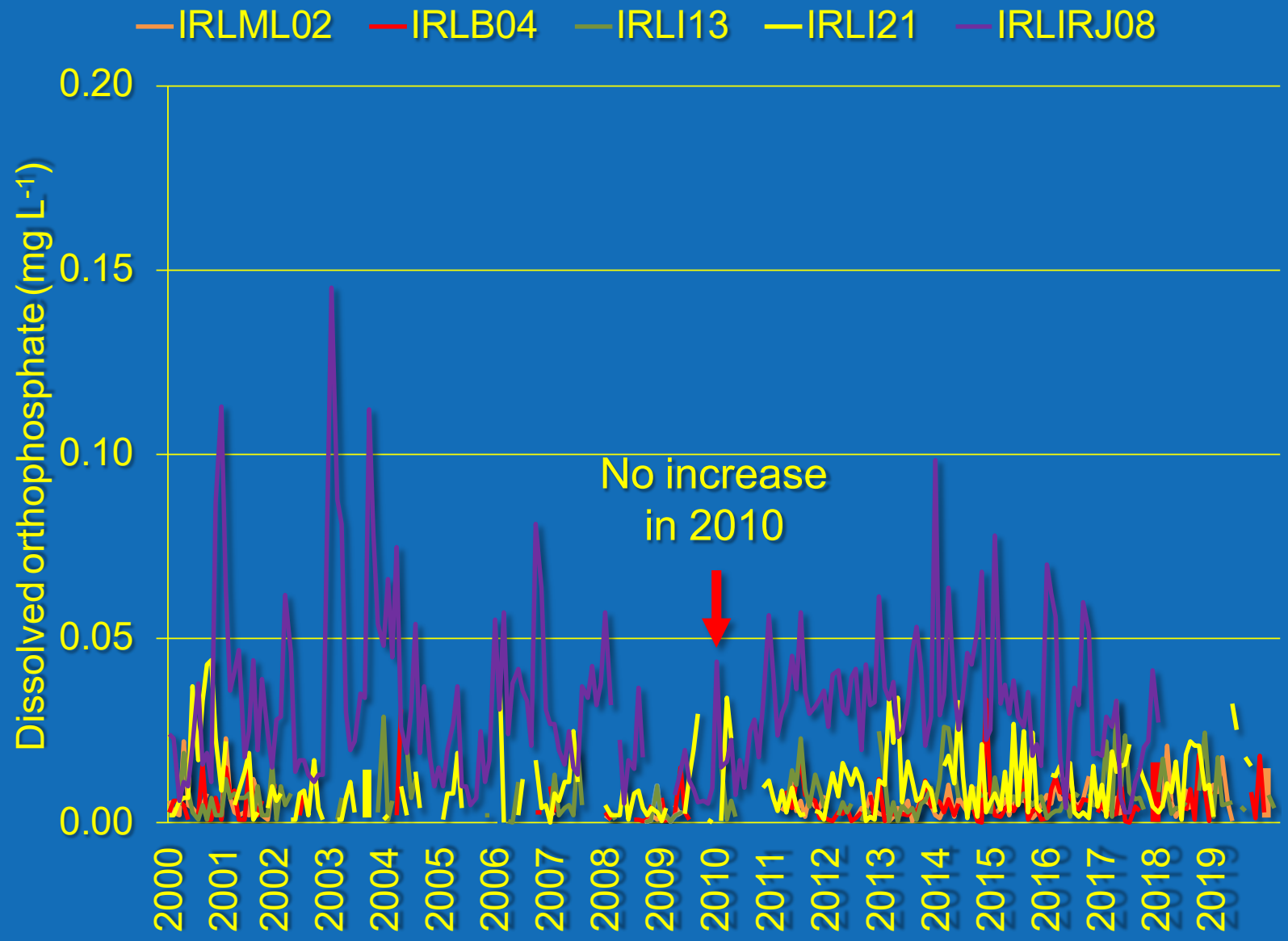

IRLML02
IRLB04
IRLI13
IRLI21
IRLIRJ08
Mosquito Lagoon often high
Is duration increased
due to loss of seagrass
Turbidity (NTU)
30
25
20
15
10
5
0
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019

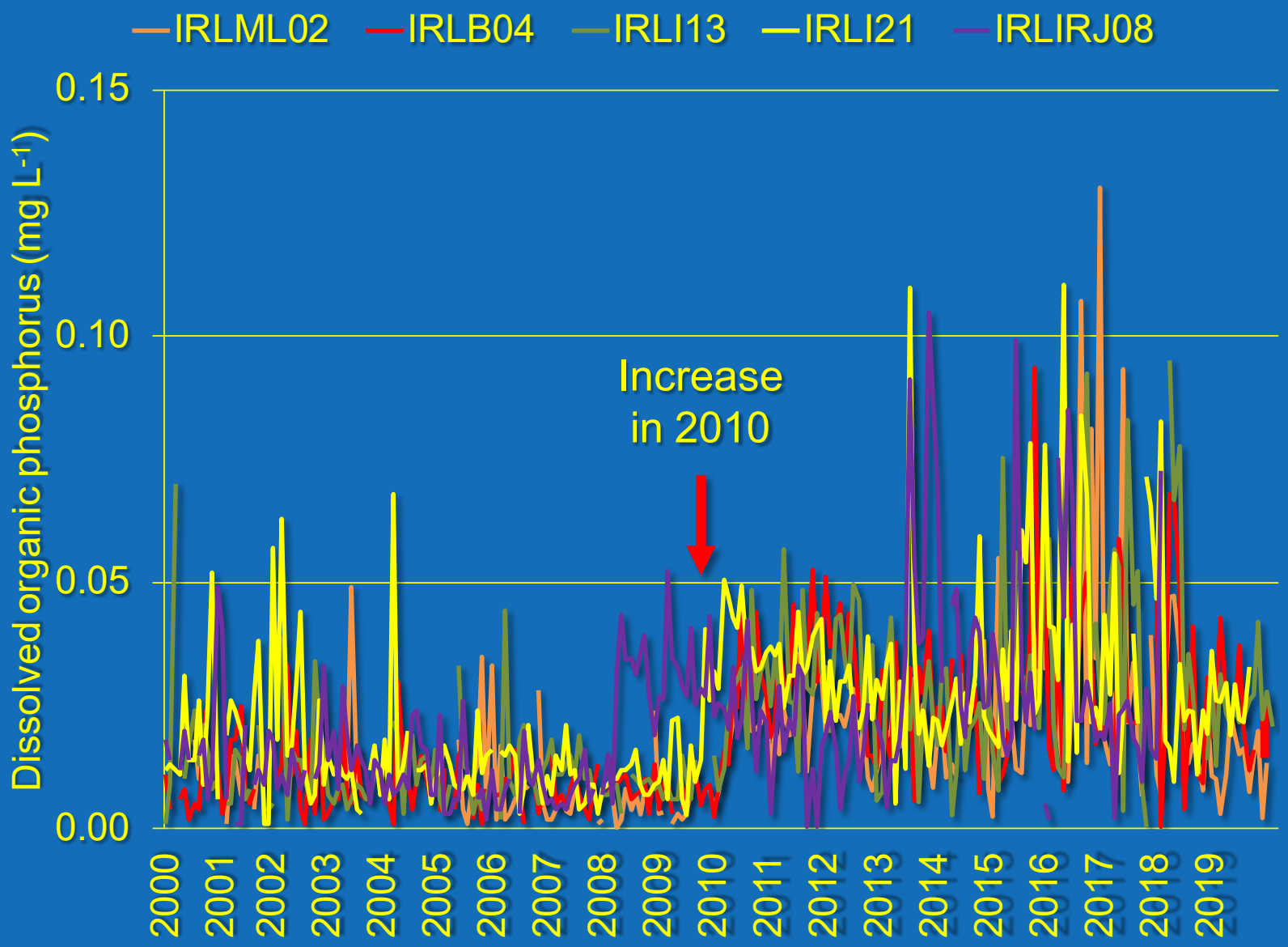

IRLML02
IRLB04
IRLI13
IRLI21
Vero
Banana River Lagoon high
Calculated chlorophyll (µg L-1)
80
60
40
20
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2019


IRLML02
IRLB04
IRLI13
IRLI21
IRLIRJ08
Mosquito Lagoon brown tide
Banana River Lagoon high Decrease may be real
Chlorophyll (µg L-1)
200
150
100
50
0
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019

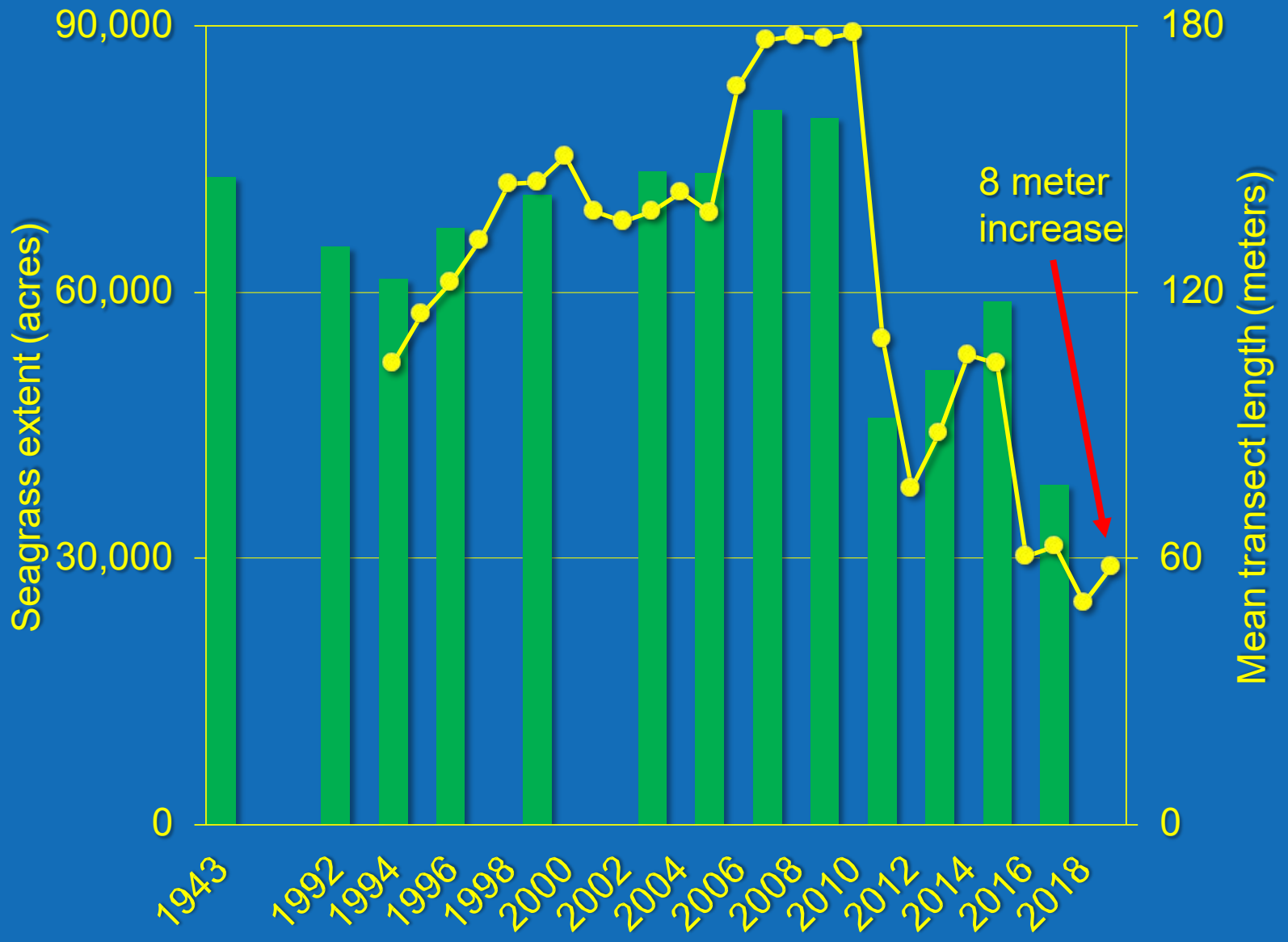

IRLML02
IRLB04
IRLI13
IRLI21
Vero
15
10
5
0
Dissolved oxygen (mg L-1)
Banana River Lagoon
low
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2019


IRLML02
IRLB04
IRLI13
IRLI21
IRLIRJ08
0.20
0.15
0.10
0.05
0.00
Total dissolved phosphorus (mgL-1)
More P
further south
Increase
in 2010
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019


IRLML02
IRLB04
IRLI13
IRLI21
IRLIRJ08
Dissolved orthophosphate (mg L-1)
0.20
0.15
0.10
0.05
0.00
No increase
in 2010
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019


IRLML02
IRLB04
IRLI13
IRLI21
IRLIRJ08
Dissolved organic phosphorus (mg L-1)
0.15
0.10
0.05
0.00
Increase in 2010
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019

St. Johns River Water Management District



Thank you

Questions & Comments

Overview of IRL BMAPs

BMAP Coordination Team

BMAP Background

Progress Toward the Total Maximum Daily Loads (TMDLs)

IRL BMAP Coordinators

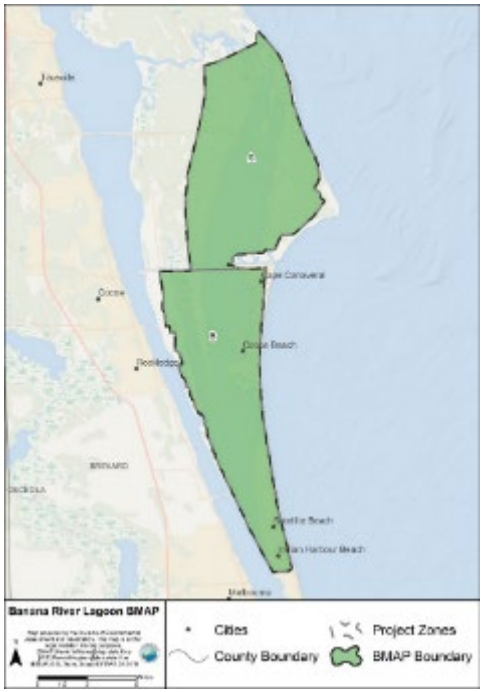
Adopted BMAP boundaries

North IRL

Stacy Cecil

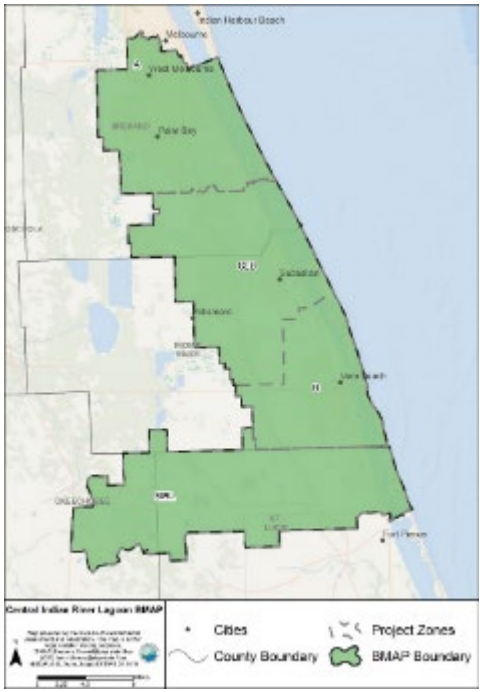
Banana River Lagoon

Stacy Cecil



Central IRL

Ted Saltos



Environmental Manager

Sara Davis

Indian River Lagoon BMAPs

- TMDLs adopted in 2009
  - Total nitrogen (TN) reductions
  - Total phosphorous (TP) reductions

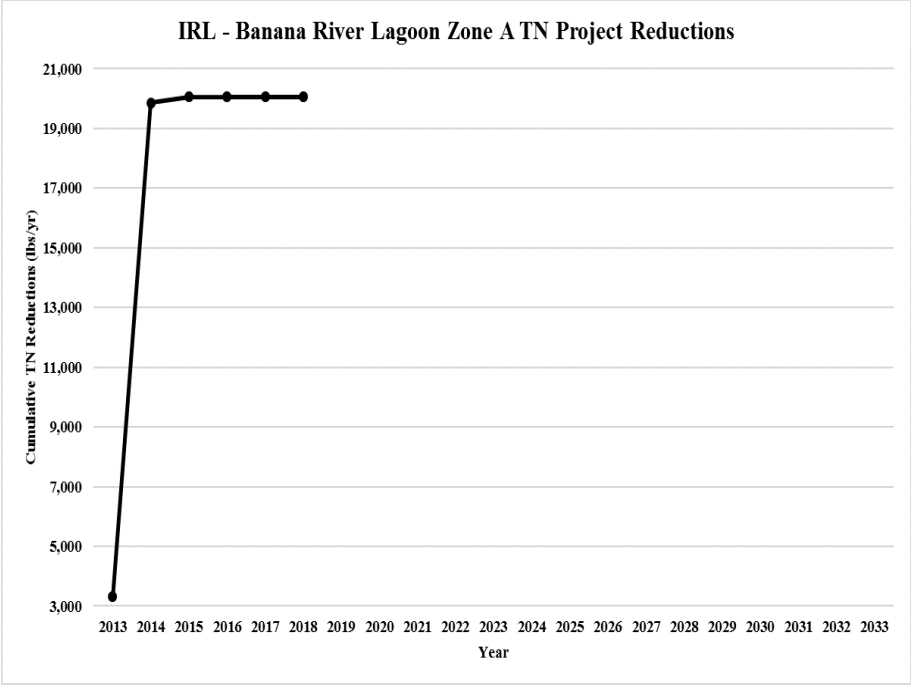
- BMAPs adopted in 2013
  - Banana River Lagoon (BRL)
    - Project Zone A: No Allocations to date
    - Project Zone B: Allocations set in 2013
  - Central Indian River Lagoon (CIRL): No Allocations to date
  - North Indian River Lagoon (NIRL): Allocations set in 2013

- Second Statewide Annual Report (STAR) compiled
  - Reporting period: January 2018 – December 2018

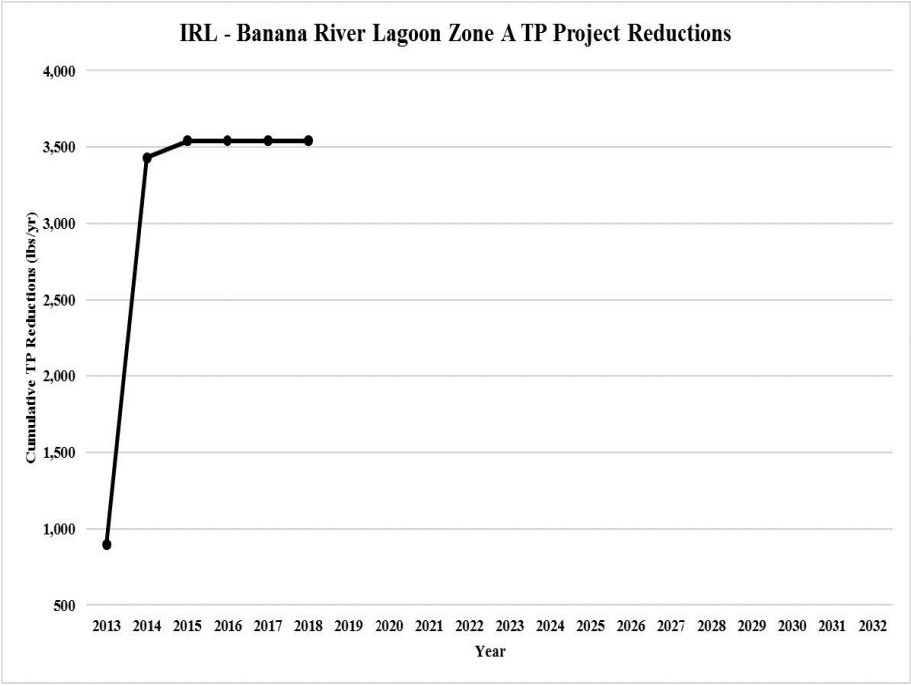
Progress Toward the TMDLs

Banana River Lagoon – Project Zone A

TN



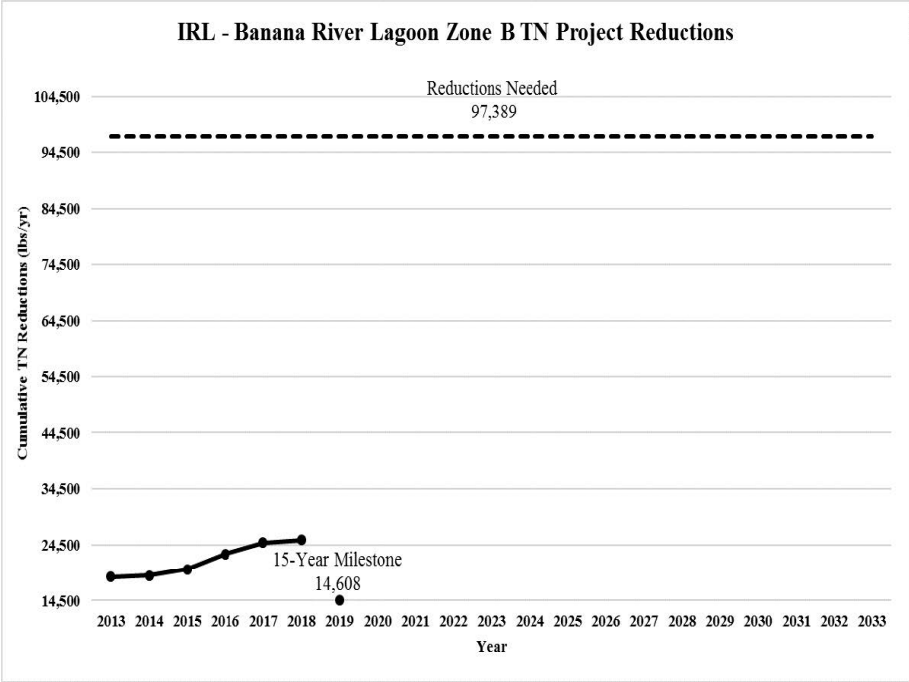
TP



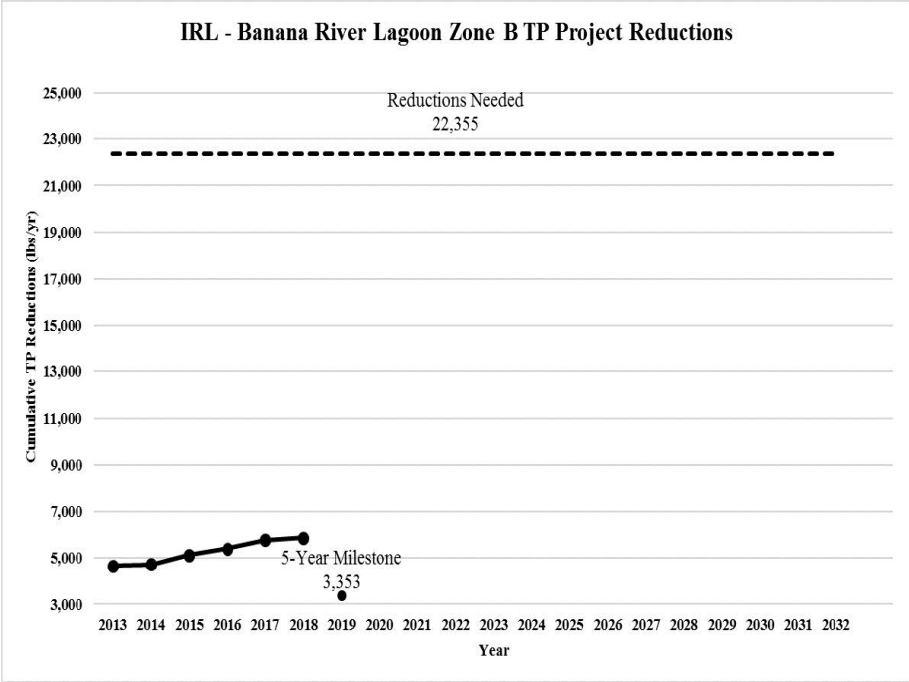
Progress Toward the TMDLs

Banana River Lagoon – Project Zone B

TN



TP



Progress Toward the TMDLs

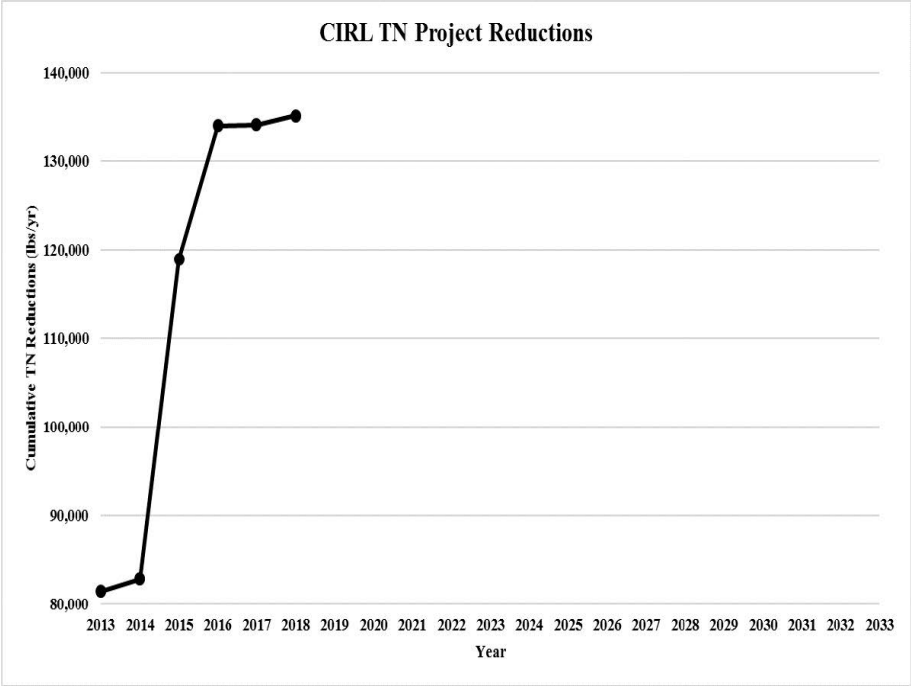
Banana River Lagoon

- 220 completed projects
- 65 underway/planned projects
- TN: 45,443 pounds per year lbs/yr estimated reductions
  - 47% of the reductions needed to meet the TMDL
- TP: 9,422 lbs/yr estimated reductions
  - 42% of the reductions needed to meet the TMDL

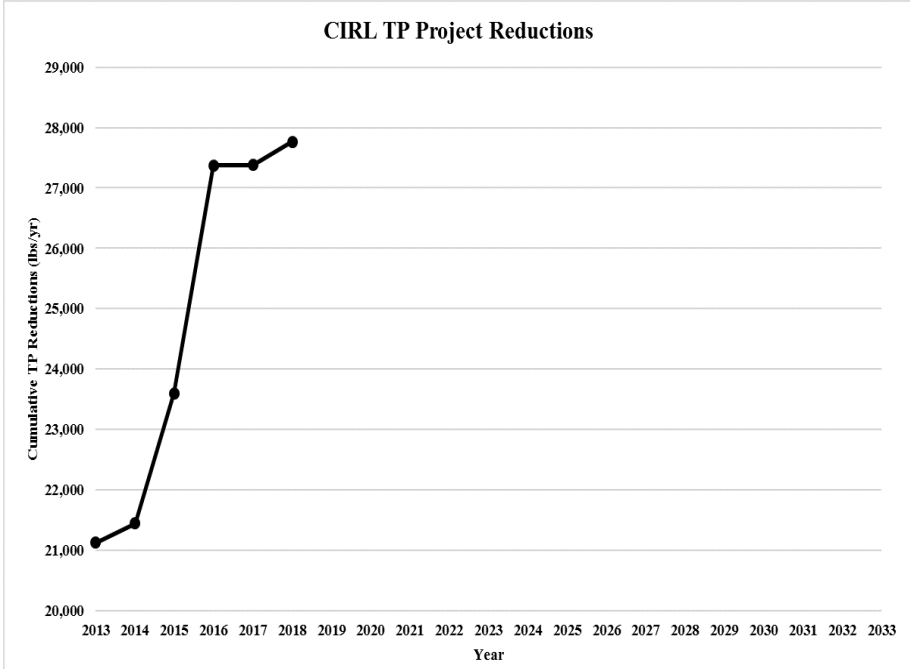
Progress Toward the TMDLs

Central IRL

TN



TP

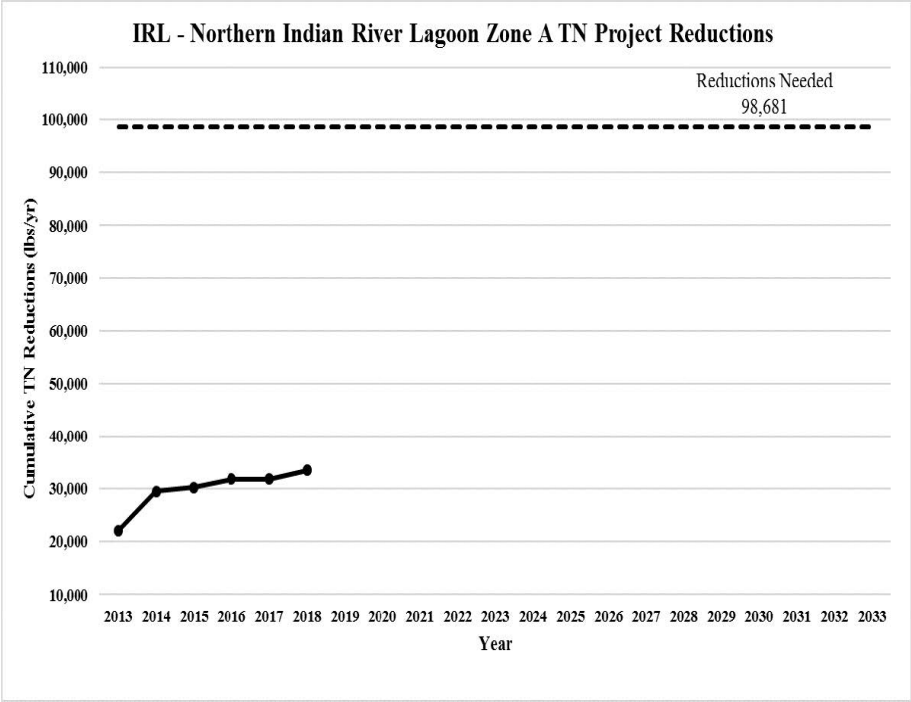


- 248 completed projects
- 61 underway/planned projects
- TN: TBD, no allocations to date
- TP: TBD, no allocations to date

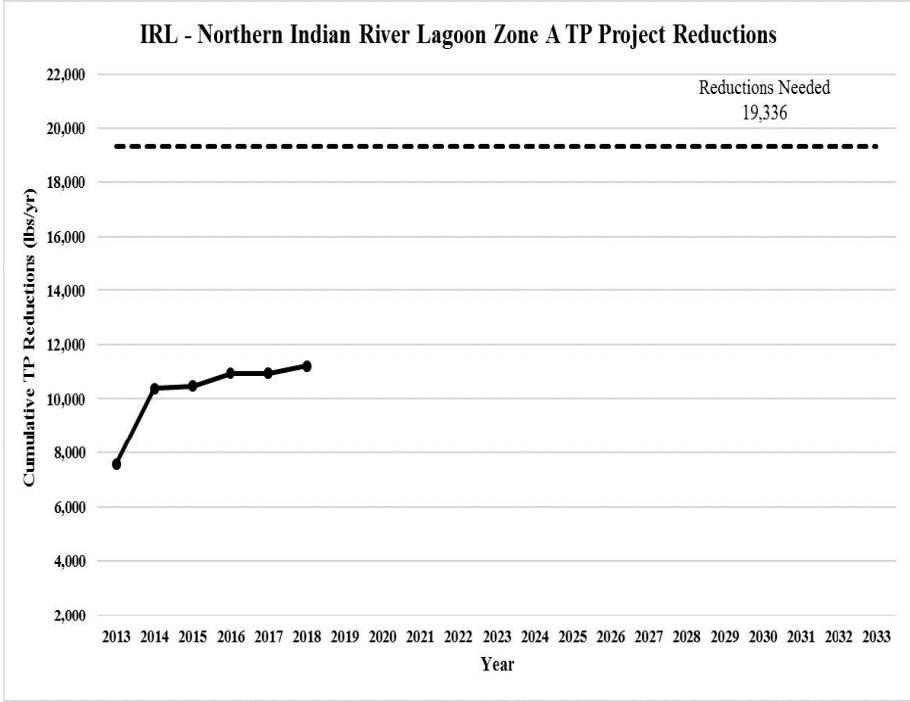
Progress Toward the TMDLs

North Indian River Lagoon – Project Zone A

TN



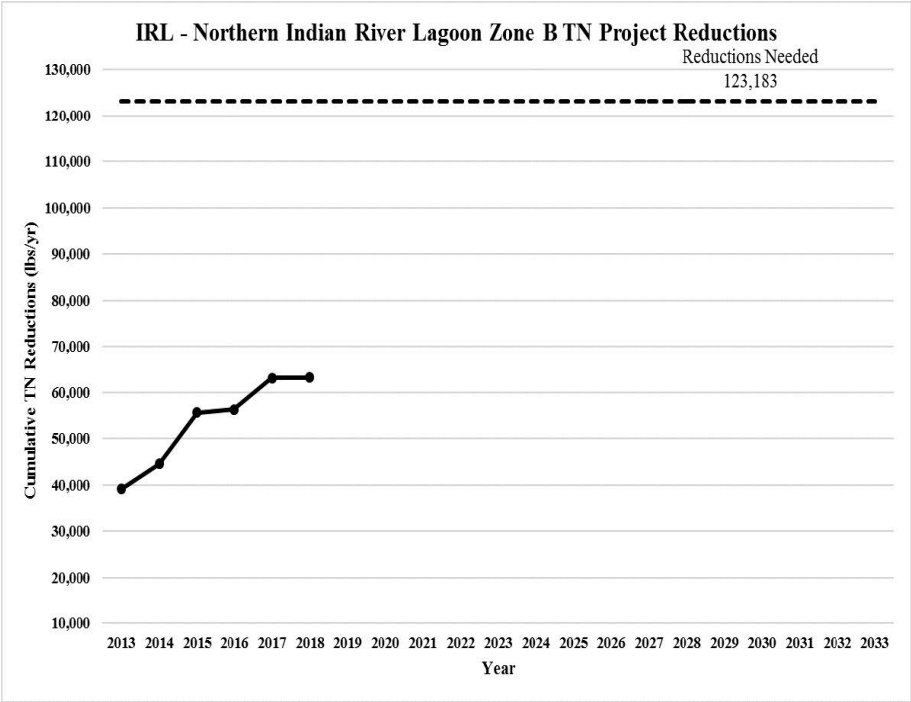
TP



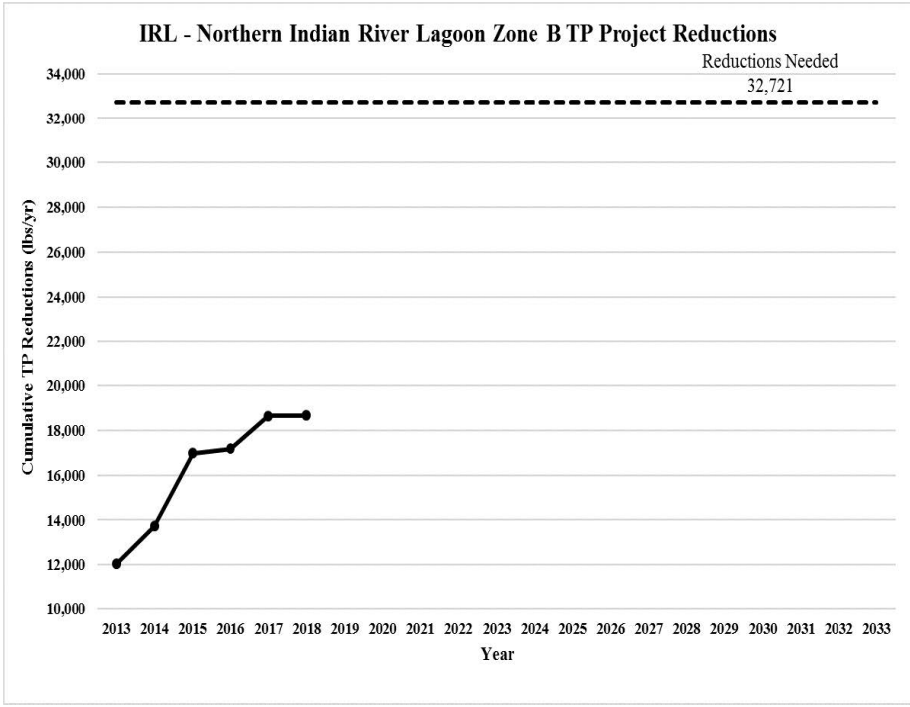
Progress Toward the TMDLs

North Indian River Lagoon – Project Zone B

TN



TP



Progress Toward the TMDLs

North Indian River Lagoon

- 201 completed projects
- 67 underway/planned projects
- TN: 96,677 pounds per year lbs/yr estimated reductions
  - 44% of the reductions needed to meet the TMDL
- TP: 29,869 lbs/yr estimated reductions
  - 57% of the reductions needed to meet the TMDL

Questions & Comments

BMAP Updates

Updates

Load Estimation and Allocations

Confirm Boundary Changes

To be included in updated BMAPs

- Allocations
  - Update for all entities
  - Develop for BRL (A) and Central/South
  - SWIL model
  - TMDL percent reductions
- Boundary Changes
  - Project Zones → Updated Segment Boundaries
  - BMAP Boundary
  - SIRL
- Other Updates

Estimated Timeline

Timing is subject to change

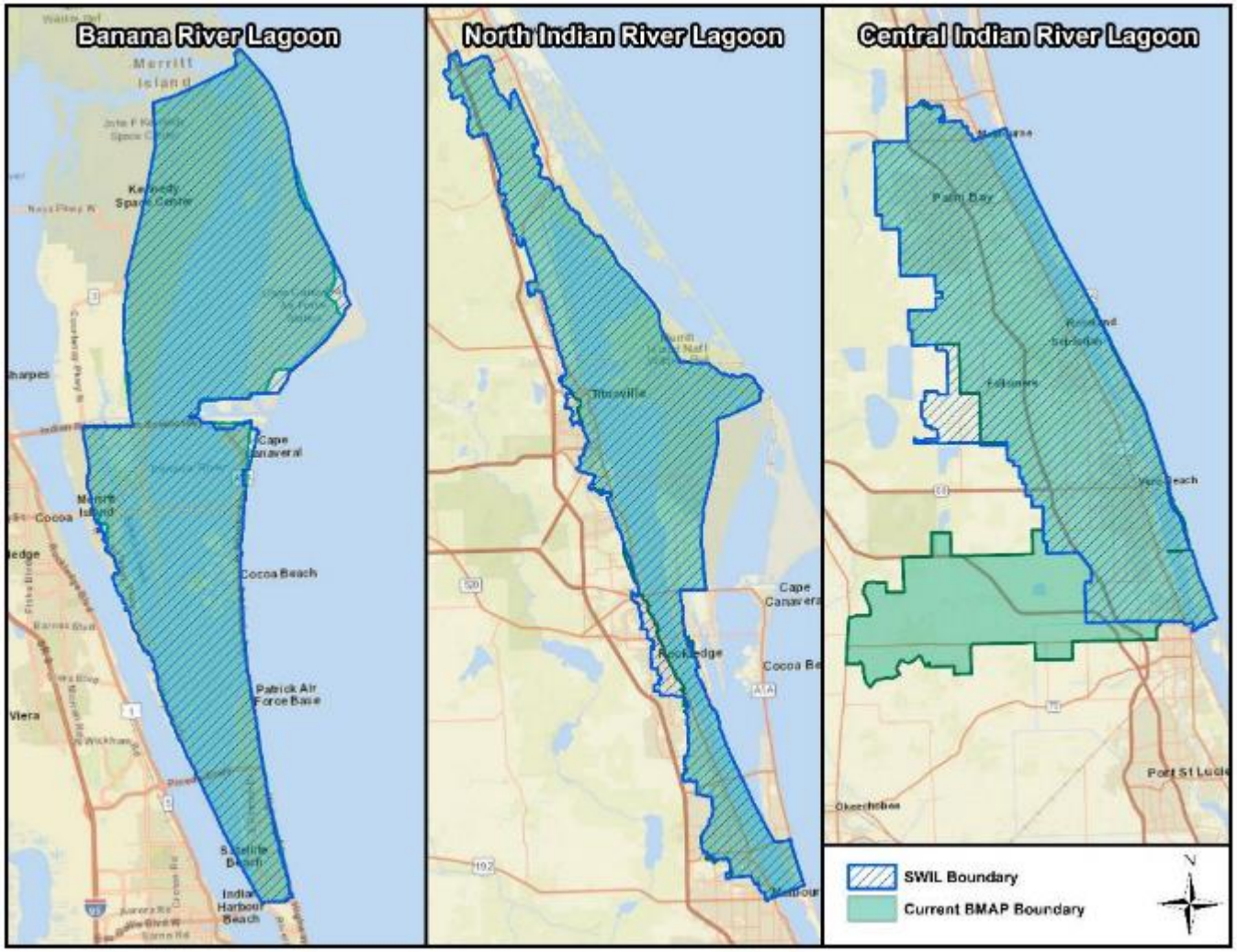
- January 15, 2020
  - STAR submittals due
- February 2020
  - Allocation Calculations & Discussions
- March 2020
  - Public Meeting
- April 2020
  - Future Project Collection
- June 2020
  - STAR Posted
- July 2020
  - Public Meeting
- October 2020
  - Public Meeting
- December 2020
  - Public Meeting
    - Seagrass Analysis

Allocation Approach

Boundary Changes

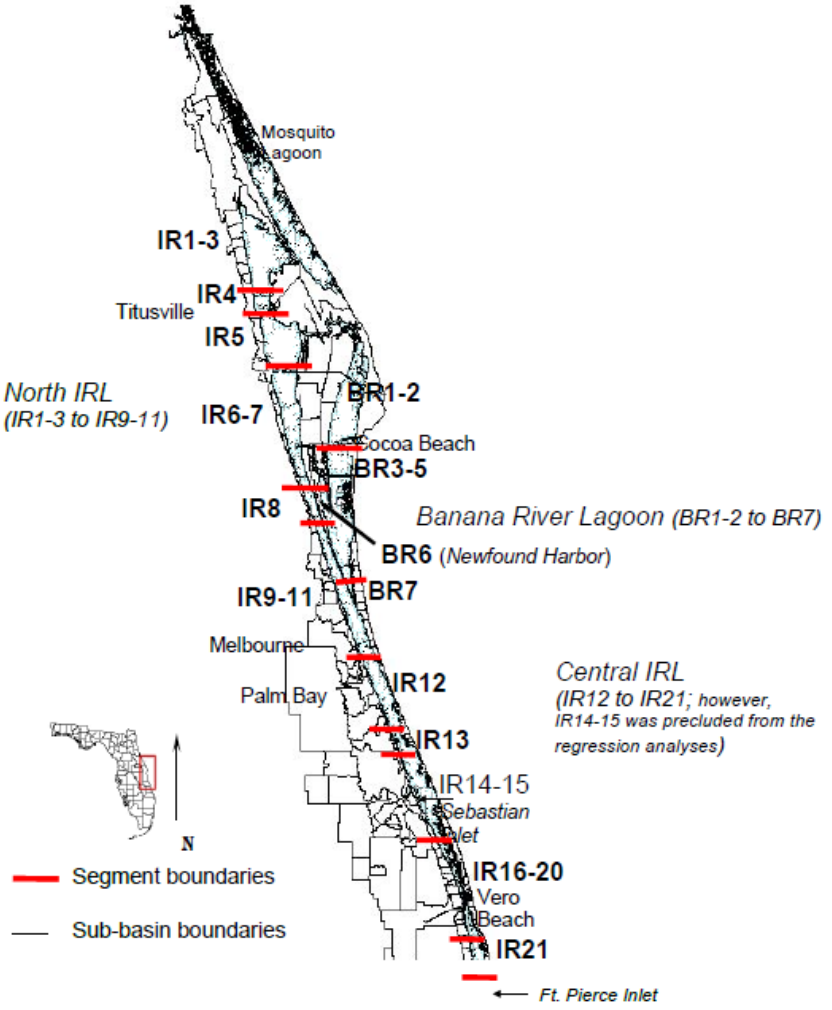
Load Estimation Tool

Review Boundary Changes



Calculating Total Loads

- With SWIL Model
- Percent reduction from TMDL
- Segments from the TMDL

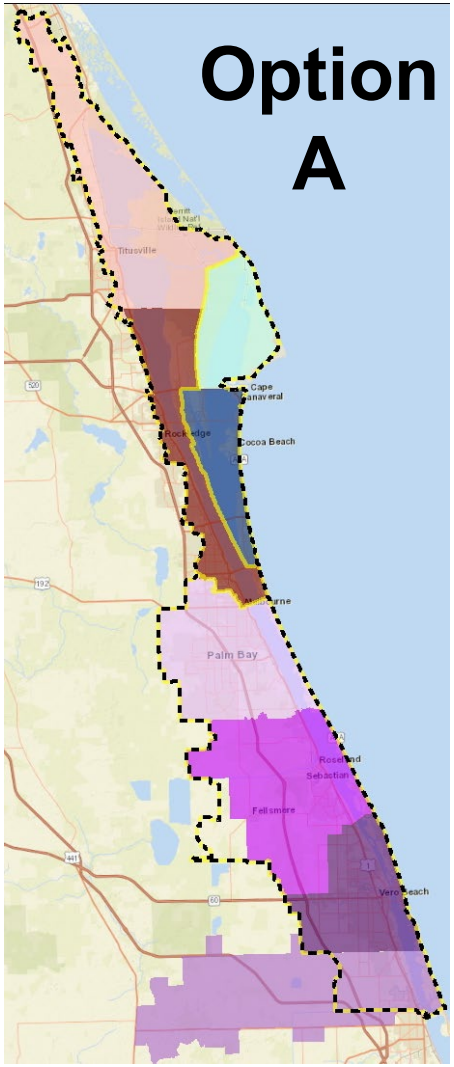


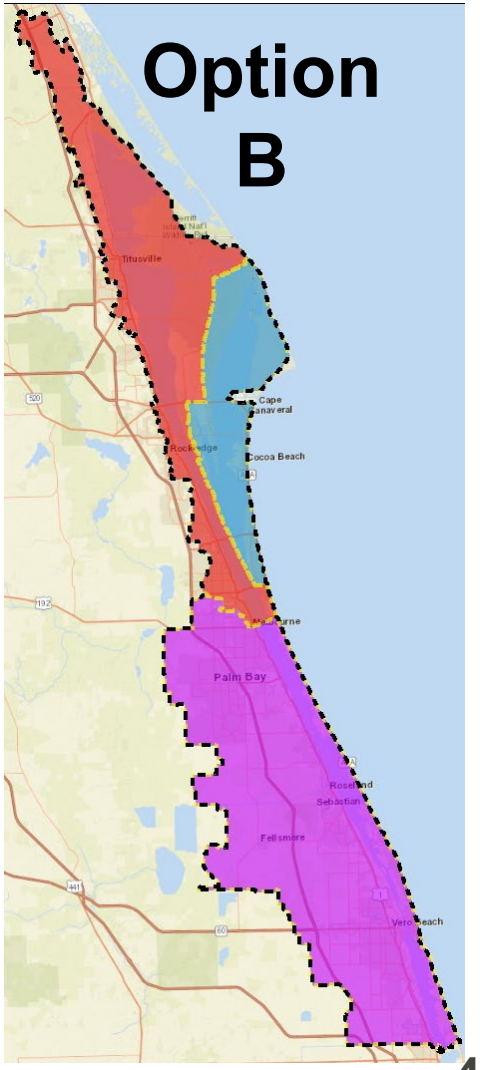
Applying Reductions

Feedback needed!

A. Project Zones
B. Total BMAP
C. Segments
(e.g. to follow)

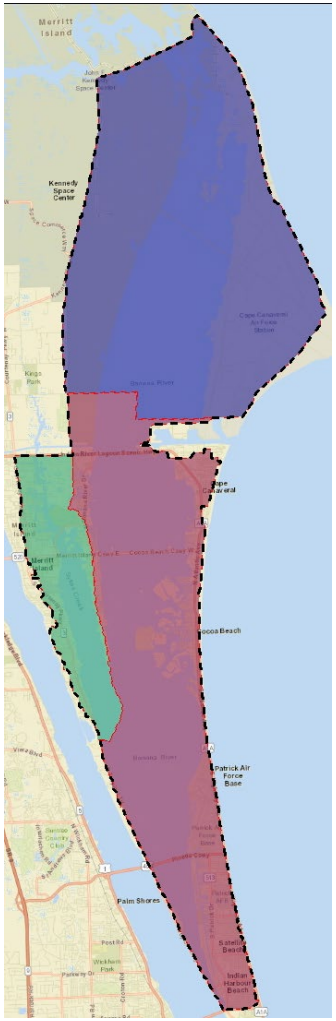
Please provide feedback on segmentation approach by Jan. 10, 2020





Proposed Segments

Banana River Lagoon



Legend

- BMAP Boundary
- Proposed Segments
- BR1-2
- BR3-5, BR7
- BR6

Please provide feedback on segmentation approach by Jan. 10, 2020

Banana River Lagoon

- 7 segments defined in Mainstem TMDL
- 1 WBID in the tributary TMDL

Project Zone A Unchanged

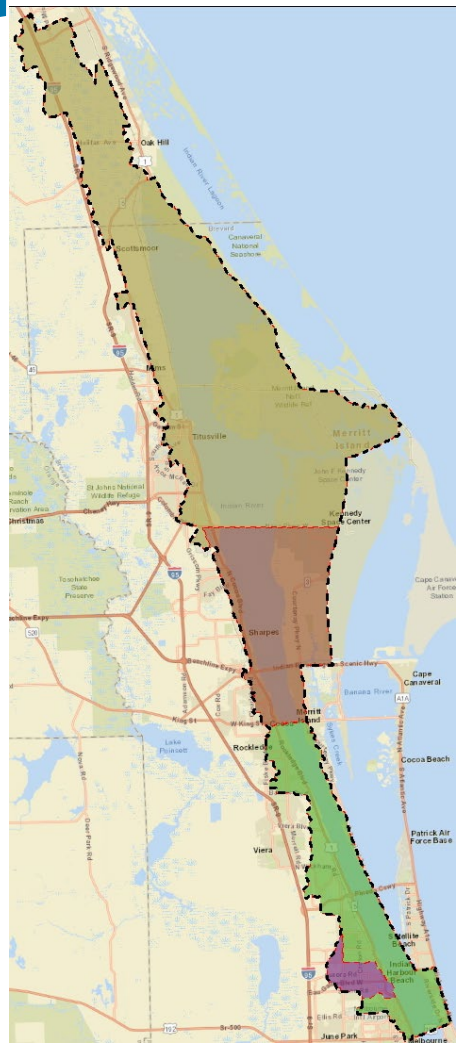
- BR1-2 –
  - Mainstem = North of Barge Canal to ~The Kennedy Observation Gantry

Project Zone B Proposed split:

- BR3-5, BR7 –
  - Mainstem = South of Barge Canal, to connection with IRL south of Mathers Bridge
- BR6 –
  - Mainstem = Newfound Harbor
  - Tributary TMDL = Sykes Creek

Proposed Segments

North Indian River Lagoon



Legend

- BMAP Boundary
- Proposed Segments
- IR1-5
- IR6-7
- IR8-11
- IR8-11, EauGallie

Please provide feedback on segmentation approach by Jan. 10, 2020

North Indian River Lagoon

- 11 segments in the Mainstem TMDL
- 2 WBIDs in the Tributary TMDL

Project Zone A Unchanged

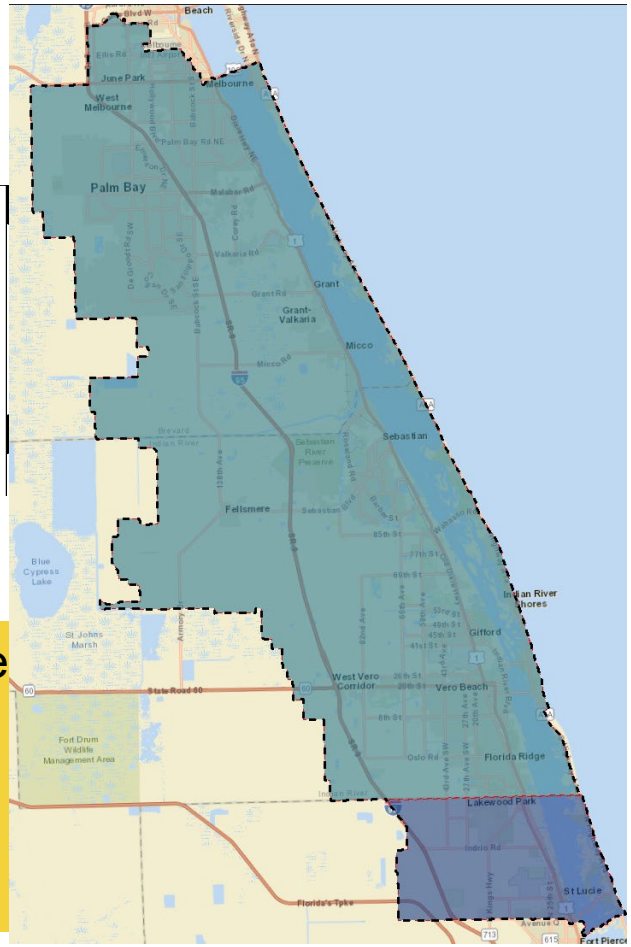
- Segments 1 – 5
  - Mainstem = IR north of Max Brewer Causeway and between the NASA and Max Brewer Causeways
  - Tributary TMDL = Addison Creek

Project Zone B Proposed split:

- Segments 6 – 7
  - Mainstem = IR between NASA and 520 Causeways
- Segments 8 – 11
  - Mainstem = Indian River between 520 & Melbourne Causeways
- **Carve out Eau Gallie River**
  - Tributary TMDL = higher % reduction required for **WBID 3082**

Proposed Segments

Central Indian River Lagoon



Please provide feedback on segmentation approach by Jan. 10, 2020

Central Indian River Lagoon

- 9 segments defined in Mainstem TMDL
- 6 WBIDs in the tributary TMDL

Condense Project Zones A, B, & SEB

- Segments 12-21 (continued from NIRL)
  - Mainstem = Between HWY 192 Melbourne Causeway and St. Lucie County Line
  - Tributary TMDL = Crane Creek, North Prong of Sebastian River, South Prong of Sebastian River Estuary & Fresh water Segments, Sebastian River above IR, C-54 Canal

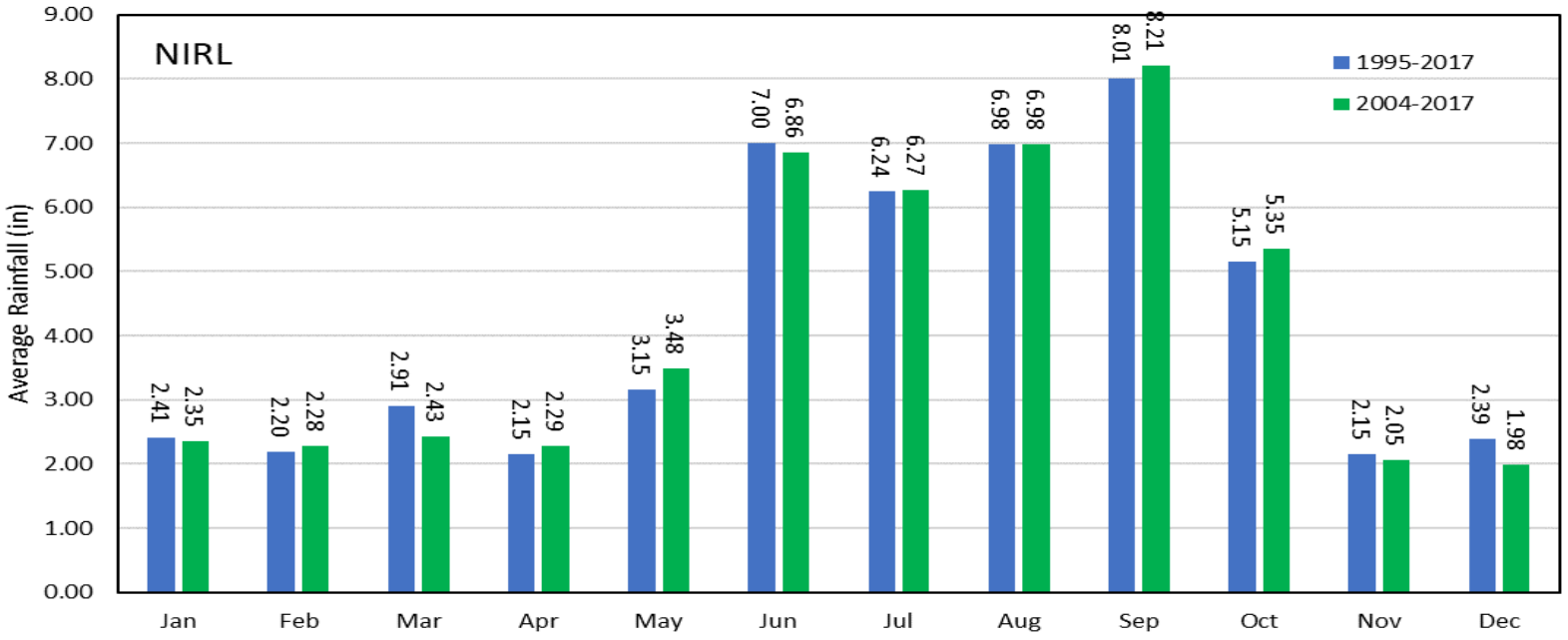
Carve out South Central IRL

- WBIDs 3163, 3163A, and 3190
  - WBID 3190 not currently impaired for nutrients
  - WBID 3163 impaired for TP, no TMDL
- **Propose to set a target based on the Water Quality Standard and SWIL model load**

Load Estimation Tool

Rainfall POR and Aggregation

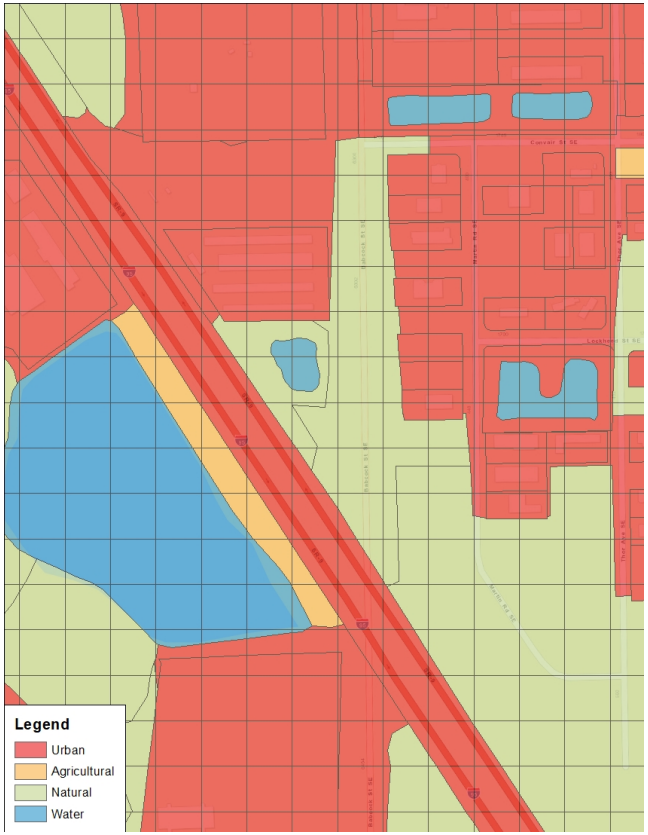
- **POR 2004 - 2017**
  - Determined to be representative and based on feedback from the last public webinar
- Average monthly rainfall over the POR to create “representative year” for a single model run (e.g., average January rainfall, average February rainfall, etc.)



Load Estimation Tool (LET)

Parameters

- 50 x 50-meter (m) cell size
  - (higher resolution than PLSM)
- Land use is from 2015
  - from water management districts land use
  - property appraiser data
  - local government natural communities land cover
- SWIL Outputs (volume, TN, TP) are monthly, and summed to get the annual total for each model cell
- Annual totals translated onto LET polygons
- Load per unit acre also calculated for each polygon
- LET shapefile covers the BMAP areas



- **Note**: Retrofit projects are not included in the model and credit needs to be recalculated using the new model

TMDL Reductions

Table 6.3 From IRL TMDL 2009

WBID	TN			TP		
	Existing Nonpoint Load (lbs/yr)	LA (lbs/yr)	% Reduction	Existing Nonpoint Load (lbs/yr)	LA (lbs/yr)	% Reduction
2963F	134,968	88,322	35%	13,901	7,307	47%
2963E	146,598	95,932	35%	24,812	13,042	47%
2963D	115,901	73,882	36%	18,618	8,752	53%
2963B+2963C	178,946	114,459	36%	36,176	18,886	48%
5003D+2963A	1299,715	577,183	56%	210,596	109,055	48%
5003B+5003C	496,348	217,877	56%	98,411	50,857	48%
3057C	127,782	41,614	67%	20,660	5,874	72%
3057A+3057B	115,122	47,539	59%	24,597	8,916	64%
3044A	46,213	15,489	66%	9,724	2,907	70%

From IRL Tributaries TMDL 2013

WBID	TN			TP		
	Existing Nonpoint Load (lbs/yr)	LA (lbs/yr)	% Reduction	Existing Nonpoint Load (lbs/yr)	LA (lbs/yr)	% Reduction
3082	79,175	28,842	51%	10,504	4,307	58%
	Table 5.23	Table 6.1-a		Table 5.23	Table 6.1-b	

Allocation Approach

Allocation Steps

For entity/jurisdictional allocations, DEP will clip/erase from SWIL load estimation tool to determine each entity's responsible acres by BMAP. The individual entity shapefiles will be created by clipping out areas sequentially, as follows:

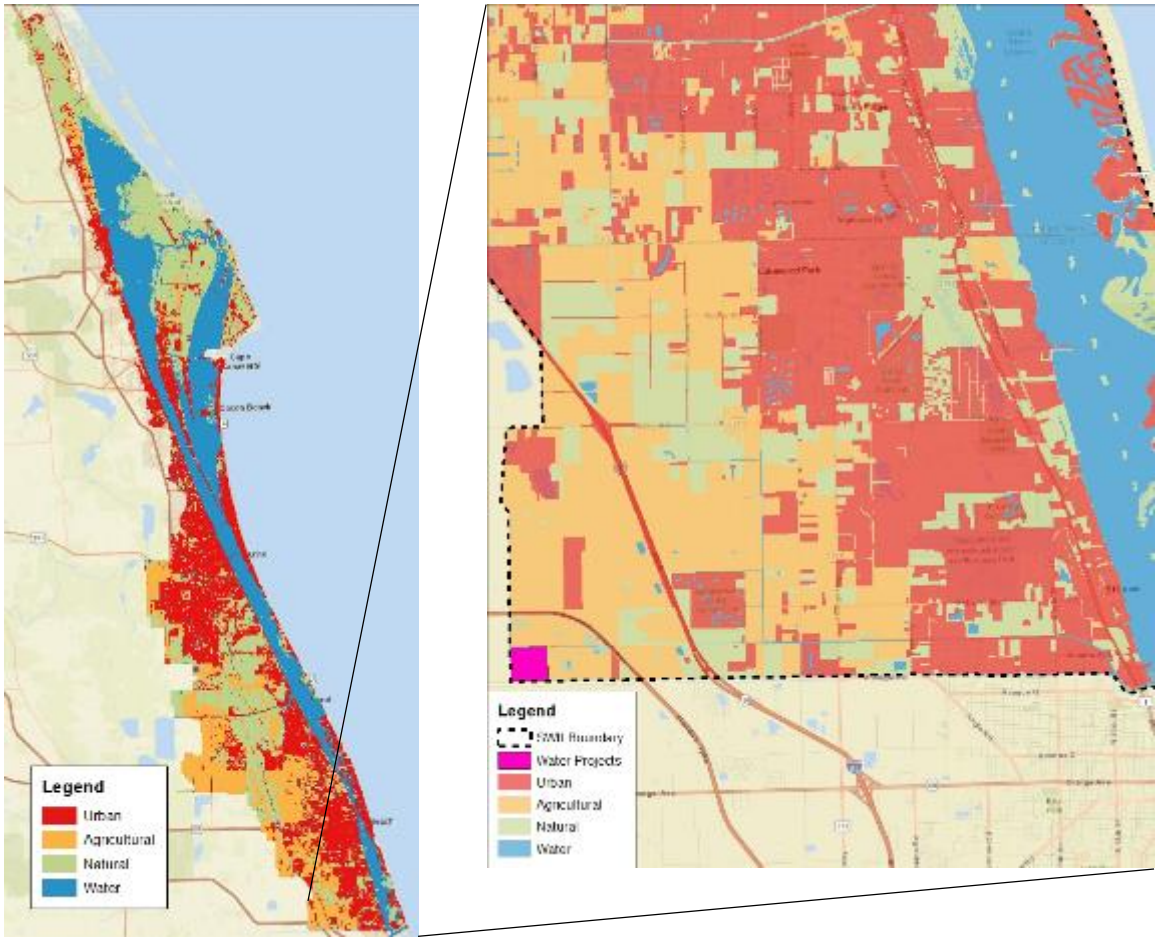
Region proj.	•Dispersed Water Management (DWM) areas or Comprehensive Everglades Restoration Plan (CERP) projects •These lands are not included in allocations
FDOT	•Florida Department of Transportation (FDOT) and Florida Turnpike •These are state roads and rights-of-way
WCDs	•Includes canals and rights-of-way belonging to water control districts, but not the entire district boundary •These lands are not included in allocations
Natural lands	•Land cover codes 3000 (upland non-forested; not including 3300), 4000 (upland forests), 5000 (water), and 6000 (wetlands) •These lands are not included in allocations
Ag	•Associated with land cover codes 2000 (agriculture) and 3300 (rangeland)
CDDs	•Any CDDs that meet the criteria will receive an allocation •Criteria: There is development (i.e., roads and infrastructure) within the CDD, the CDD discharges to an MS4, and the CDD pays a stormwater fee and receives a refund of the fee.
Munic. County	Municipalities. Then the remaining areas assigned to each county.

Allocation Approach

Allocation Steps

Please provide feedback on segmentation approach by Jan. 10, 2020

SWIL & Land Use LET



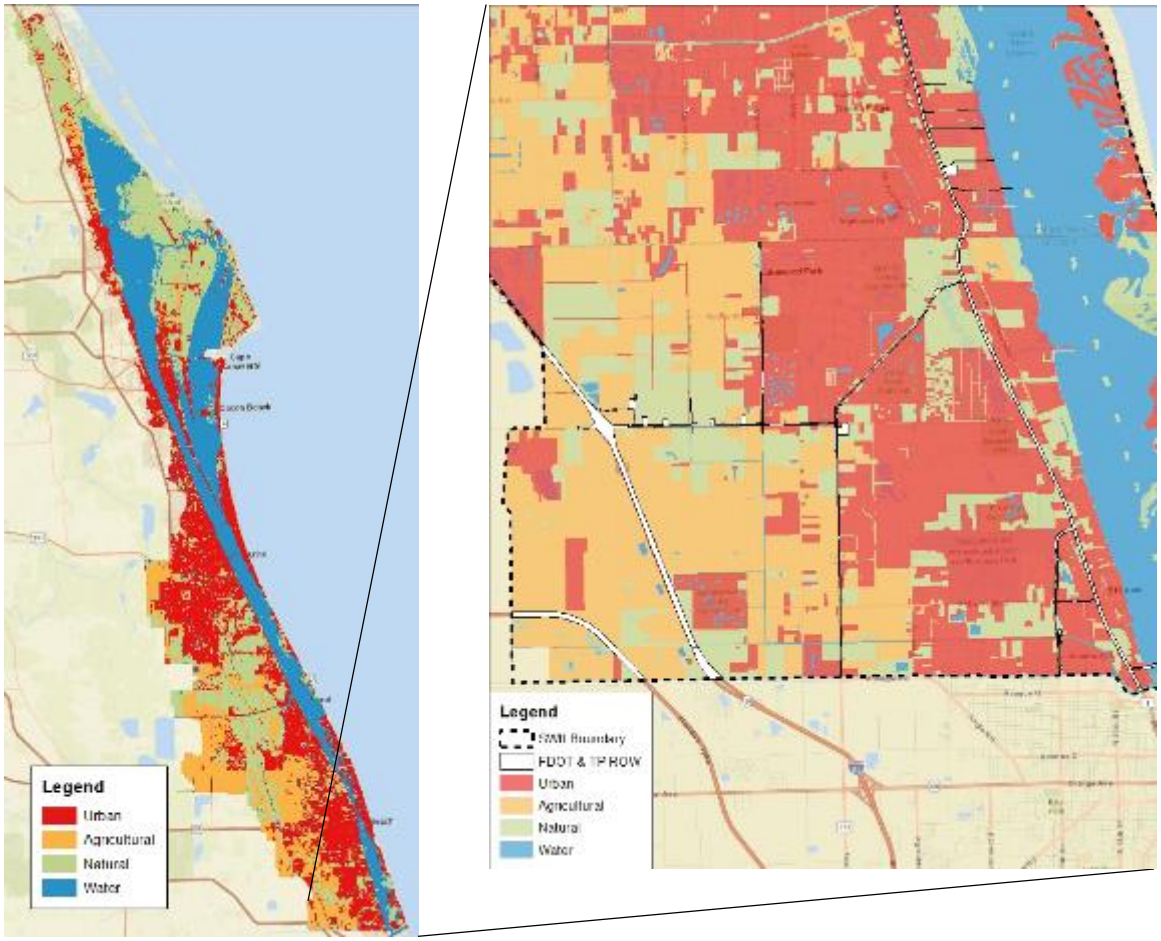
Erase Regional Projects

Allocation Approach

Allocation Steps

Please provide feedback on segmentation approach by Jan. 10, 2020

SWIL & Land Use LET



Erase Regional Projects

Clip then Erase Transportation

Allocation Approach

Allocation Steps

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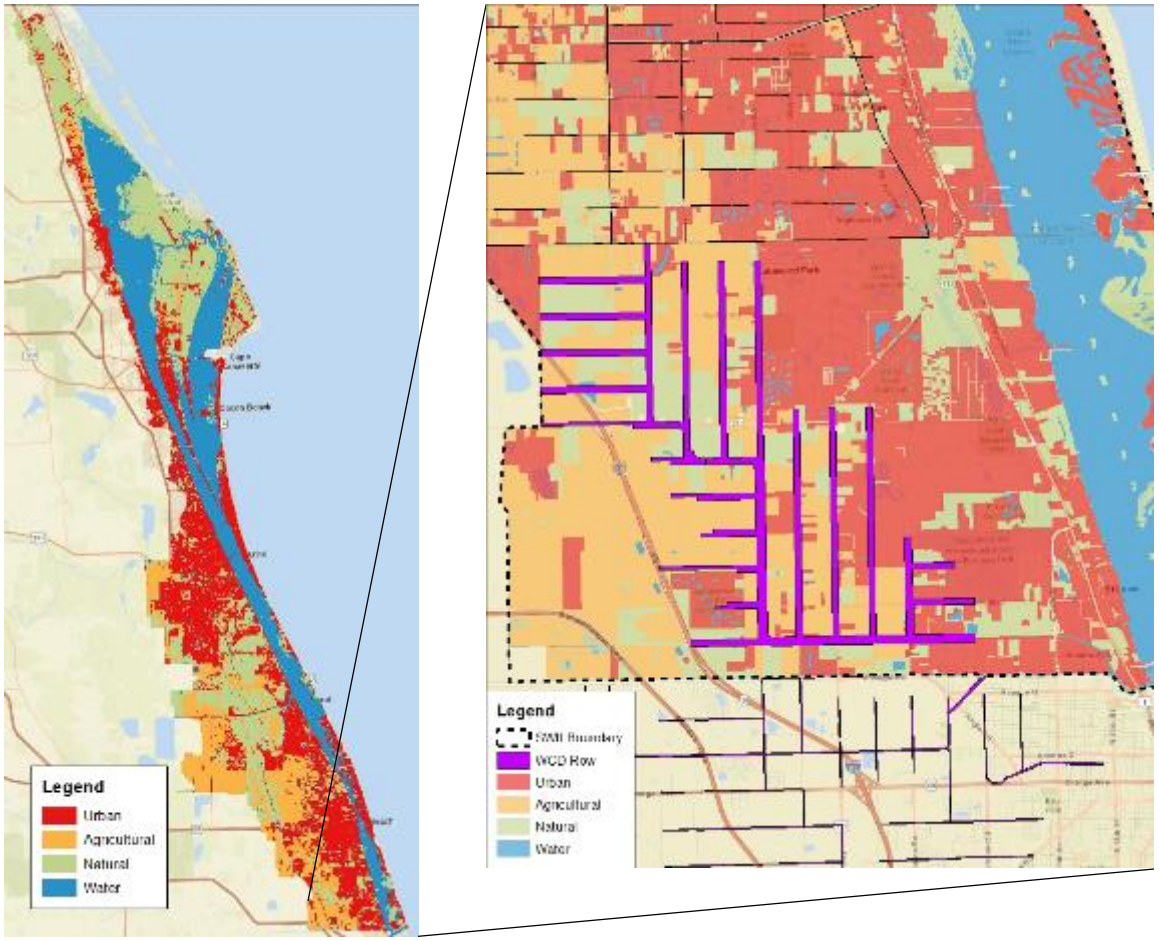
SWIL & Land Use LET



Erase Regional Projects

Clip then Erase Transportation

Erase WCD Canals and ROWs

Allocation Approach

Allocation Steps

Please provide feedback on segmentation approach by Jan. 10, 2020

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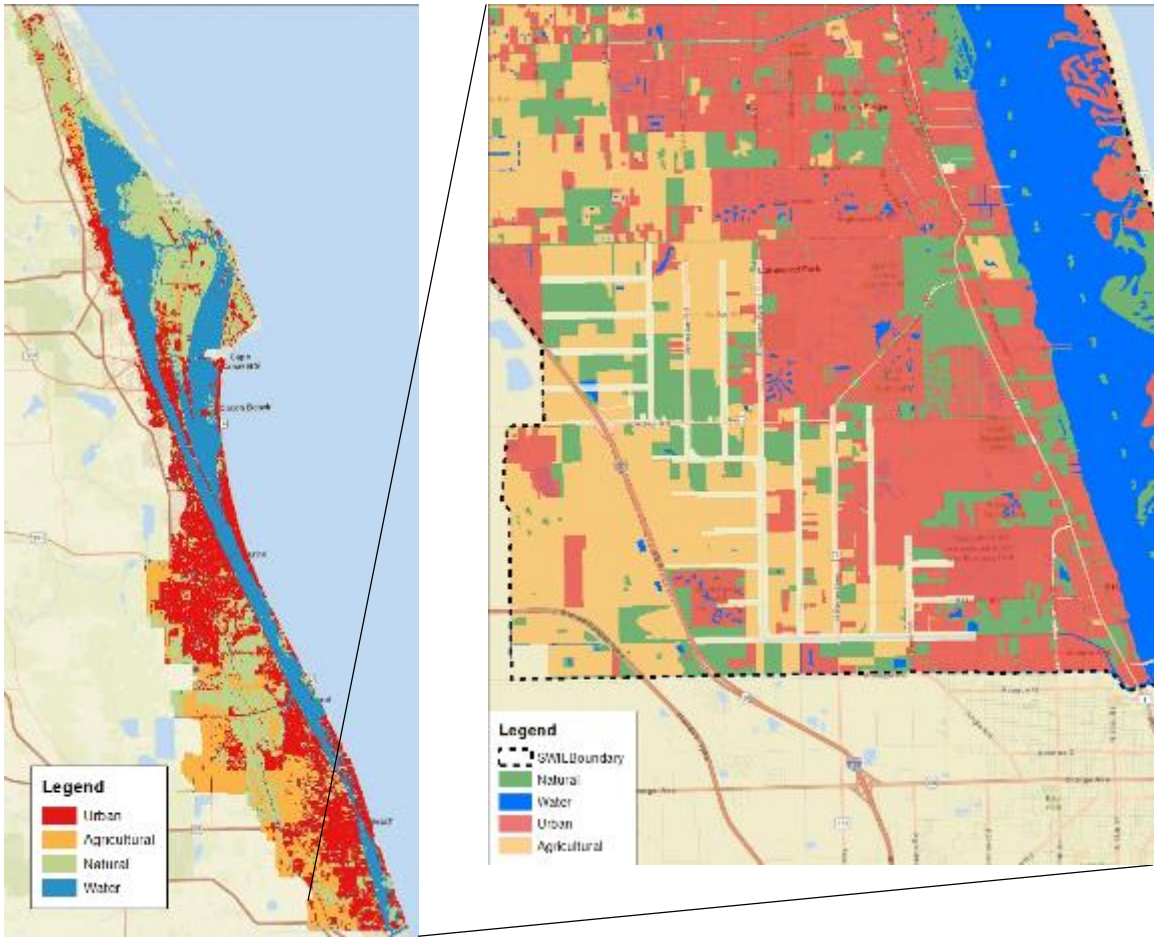

Erase Regional Projects

Clip then Erase Transportation

Erase WCD Canals and ROWs

Erase Natural Lands & Water

Allocation Approach

Allocation Steps

Please provide feedback on segmentation approach by Jan. 10, 2020

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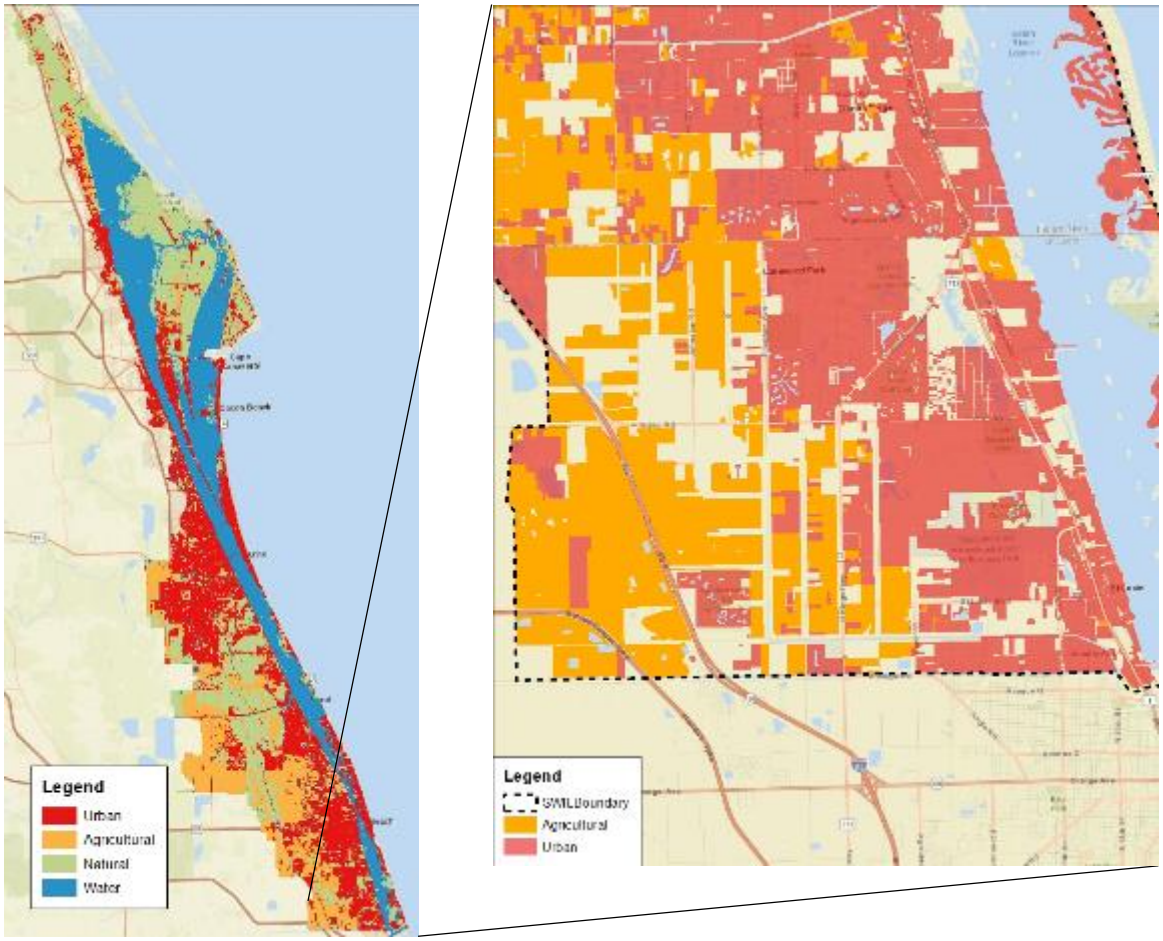

Erase Regional Projects

Clip then Erase Transportation

Erase WCD Canals and ROWs

Erase Natural Lands & Water

Erase Agricultural Lands

Allocation Approach

Allocation Steps

Please provide feedback on segmentation approach by Jan. 10, 2020

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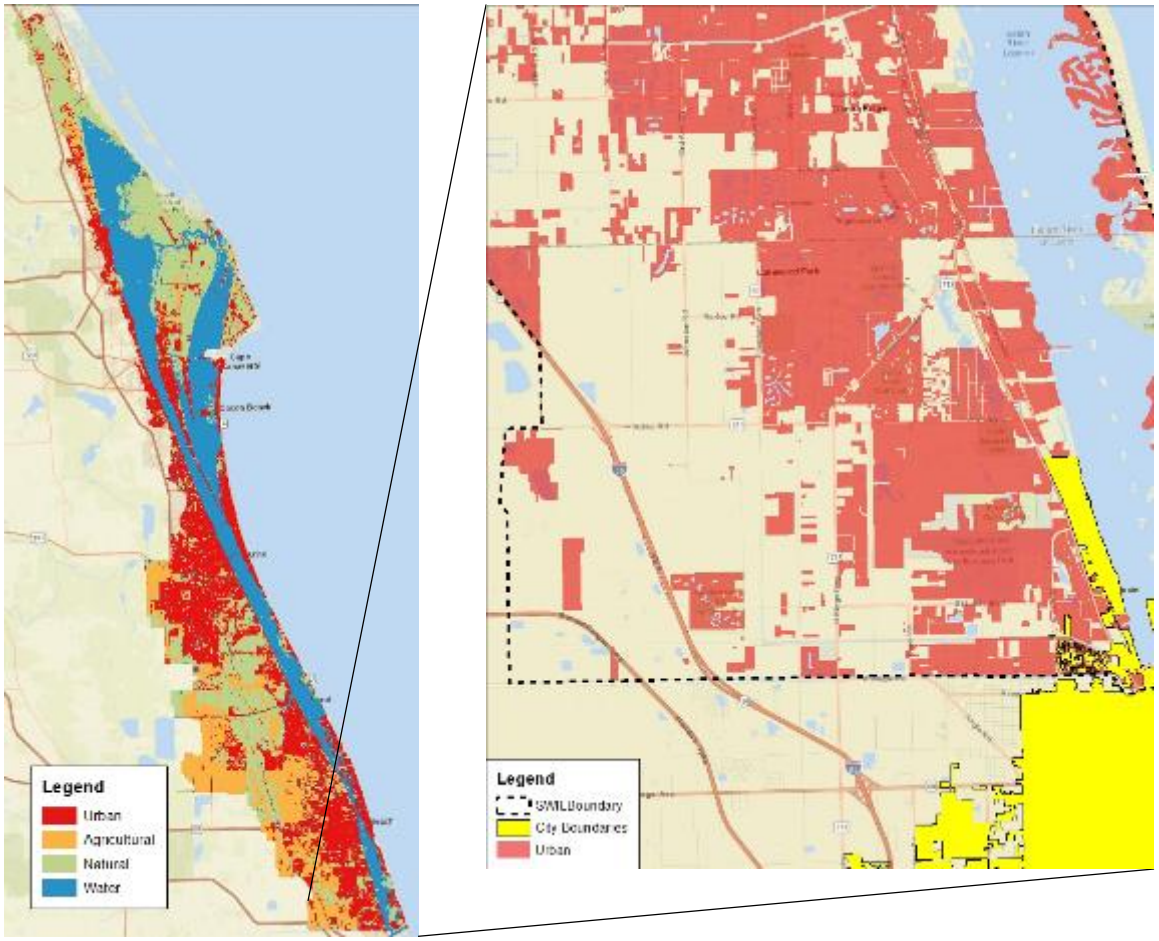

Erase Regional Projects

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Erase WCD Canals and ROWs

Erase Natural Lands & Water

Erase Agricultural Lands

***Clip then Erase CDDs**

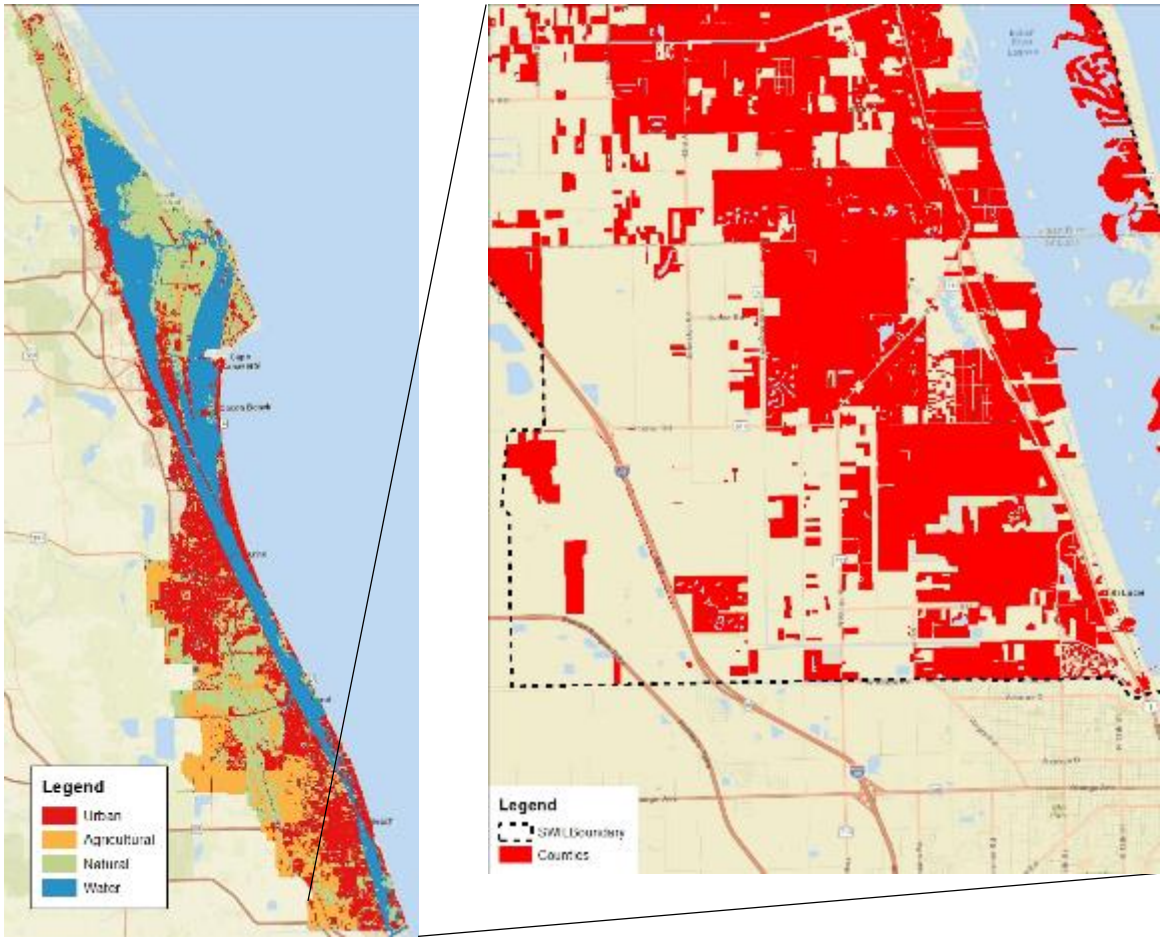
Clip then Erase Municipalities

Allocation Approach

Allocation Steps

Please provide feedback on segmentation approach by Jan. 10, 2020

SWIL & Land Use LET



Erase Regional Projects

Clip then Erase Transportation

Erase WCD Canals and ROWs

Erase Natural Lands & Water

Erase Agricultural Lands

***Clip then Erase CDDs**

Clip then Erase Municipalities

Clip Counties

Allocation Approach

Methodology

- Next step is to calculate required reductions
  - TN starting load for the entire segment group times the % TMDL reduction = total required reduction for segment group
    - E.g. *3,953,940 lb/yr x 23% = 909,406 lb/yr*
  - Required reduction will be assigned to stakeholders based on their percent contribution to the total starting load
- Stakeholders in multiple segments in the same BMAP?
  - Add the required reductions together for stakeholder total
- Stakeholders in multiple BMAPs?
  - Required reductions remain separate for each BMAP

**Note that these numbers are for example purposes only and do not reflect actual allocations to any entity*

Allocation Approach

Example calculations table:

Entity	Starting Load	% Contrib.	Required Reduction
A	36,171	1%	9,675
B	180,855	5%	48,373
C	361,710	11%	96,745
D	2,821,341	83%	754,614
Total	**3,400,077**	**100%**	**909,406**

SG 1 BMAP A

Entity	Starting Load	% Contrib.	Required Reduction
A	3,171	6%	981
B	25,855	52%	7,997
C	4,710	9%	1,457
D	16,341	33%	5,054
Total	**50,077**	**100%**	**15,489**

SG 2 BMAP A

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Allocation Approach

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SG 2 BMAP A

10,656 lb/yr
Reduction for Stakeholder A in BMAP A

**Note that these numbers are for example purposes only and do not reflect actual allocations to any entity*

Questions & Comments

Statewide Annual Report (STAR)

STAR Background

STAR 2019 Progress

STAR 2020 Timeline

STAR Background

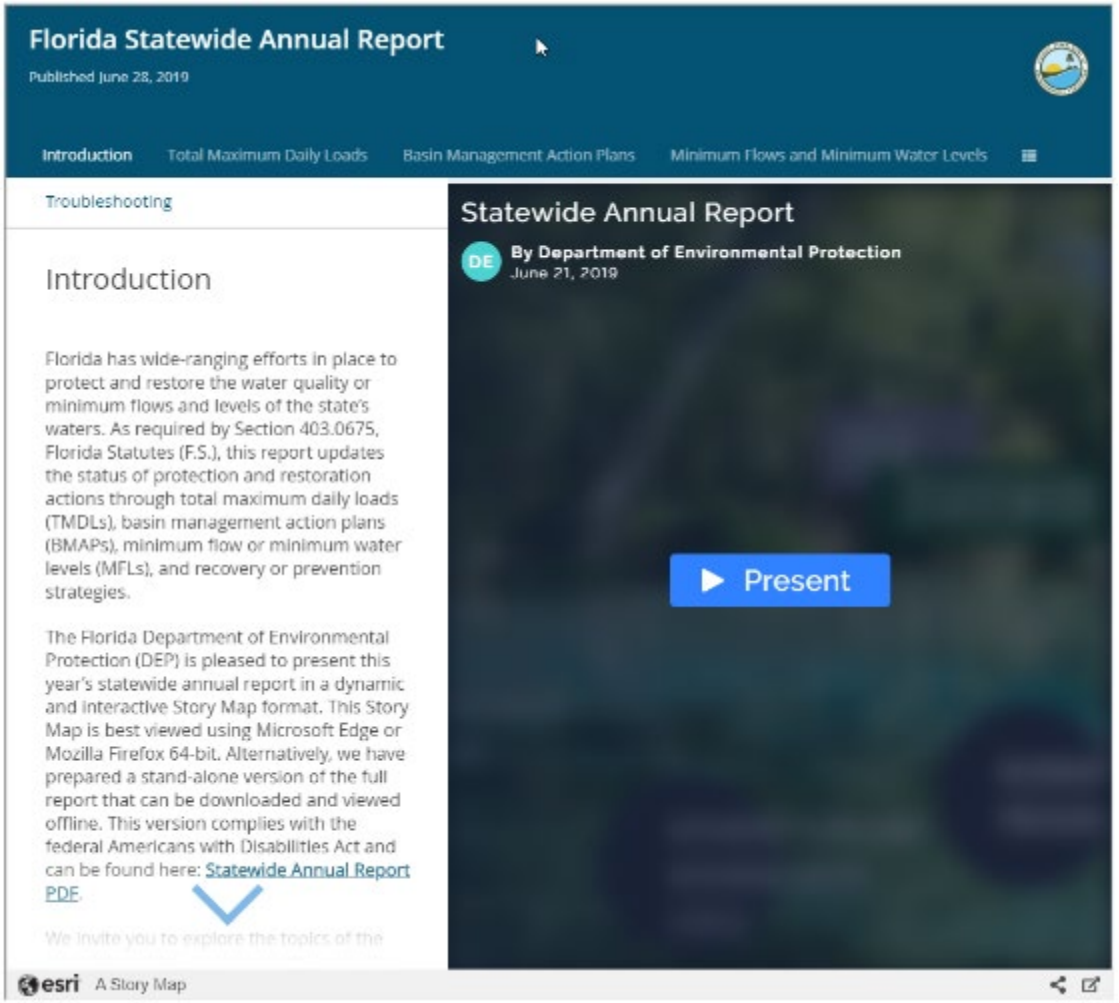
- Requirement under Section 403.0675 Florida Statutes (F.S.) to provide an annual update to the Governor and Legislature
- Summarizes accomplishments in the BMAPs statewide
- Reports on restoration projects and management strategies
- All BMAP reporting periods align with calendar year
- Submitted to the Governor and the Legislature by July 1 of each year
- Annual meetings → opportunity to highlight stakeholder activities

STAR

Second STAR submitted to the Governor and the Legislature June 28, 2019

Viewable as interactive story map

https://floridadep.gov/STAR



STAR Timeline

STAR Timeline

Request for review project updates through Dec. 31, 2019

Deadline for project information to be submitted to DEP

Draft Report Compiled

Report submitted to Governor and Legislature and web posted

Questions & Comments

Next Steps

- *Provide feedback on segmentation and allocation approach by January 10, 2020*
- *Submit STAR project updates by January 15, 2020*
- *Apply allocation approach to provide allocation numbers*
- *Additional public meetings in 2020*
  - Next tentatively scheduled for March
- *BMAP update progress through 2020*

Contact Information

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FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION